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Riboflavin, Nitrogen, and Thiamine Metabolism of Women with Active Tuberculosis[1]

WILMA D. BREWER, HELEN L. TOBEY, DA HWEI PENG KAN, MARGARET A. OHLSON, and C. J. STRINGER[2]

Department of Foods and Nutrition and Institute of Nutrition, Michigan State College, East Lansing, and Ingham County Sanatorium, Lansing

MEASUREMENTS of the urinary excretion of riboflavin at various dietary intakes have provided a basis for estimation of the riboflavin requirement of individuals and an index for studying the metabolism of the vitamin. The quantitative requirement of riboflavin of an individual, however, may depend upon the dietary intake of other nutrients. Investigators, among whom are Czaczkes and Guggenheim (1) and Riesen and co-workers (2), found that liver storage of riboflavin in the rat increased when dietary protein was increased. An inverse relationship of nitrogen retention and riboflavin excretion has been reported by Sarett (3) and Oldham (4), although studies made by Hagedorn (5) and Mickelsen (6) failed to confirm this particular relationship.

Preliminary studies indicated that the urinary excretions of riboflavin by tuberculous women may exceed those of healthy women at similar intakes. As a result of these observations and since dietary protein has been considered important in tuberculosis therapy, it was planned to investigate simultaneously the nitrogen and riboflavin metabolism of tuberculous patients. Values for the thiamine intakes and excretions of these patients also are presented.

EXPERIMENTAL PROCEDURE

Six women with moderately advanced, active pulmonary tuberculosis who were bed patients at the county tuberculosis sanatorium acted as subjects. The patients received the usual hospital diet throughout the study. Adjustments in nitrogen and riboflavin intakes were made by variations in milk intake and use of riboflavin supplements. For Periods 1 and 2, the subjects were restricted to 300 gm. milk daily; for Periods 3 and 4, the milk intake was increased to 1200 gm. per day. During Periods 2 and 4, a daily supplement of 5 mg. riboflavin[3] was added to the diet. Vitamin supplements equivalent to 300 I.U. vitamin D, 5000 I.U. vitamin A, and 300 mg. ascorbic acid were provided daily for the four periods.

Each period consisted of fourteen days of dietary adjustment followed by a seven-day test period. Records of weighed food intake were obtained regularly.

During the test period, aliquots equivalent to one-fifth of the weight of each serving of food, and complete fecal and urine collections were obtained. Riboflavin and thiamine analyses were made on composites of food and urine for the first three days, the second three days, and the last day of the balance study and on fecal composites for the seven-day period.

Food and fecal samples were acid-hydrolyzed, adjusted to a *p*H of 4.5 and incubated overnight with polidase-S enzyme. The riboflavin and thiamine content of the extract was determined fluorometrically by the Conner and Straub procedure (7). Urinary riboflavin was determined by this method, as modified by Keys (8); destruction of riboflavin was accomplished in sample blanks by exposure of urine aliquots to ultraviolet light. Urinary thiamine was determined by the method of Mickelsen (9).

[1] The data for this paper were taken in part from a thesis presented by Wilma D. Brewer to the Graduate School of Michigan State College in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Approved by the Director of the Michigan Agricultural Experiment Station for publication as Journal article No. 1060 n.s. Received for publication May 12, 1950.

[2] The authors wish to express their appreciation to the medical staff of the Ingham County Sanatorium and to the sanatorium patients who were subjects of the study for their cooperation and assistance. Further acknowledgment is made to Dr. Leo Katz for advice regarding the statistical analysis of data and to Betty Cole, Dorothy Dunsing, and Janet Traver for technical assistance.

[3] Acknowledgment is made to Merck and Co., Inc., Rahway, New Jersey, for a supply of riboflavin and thiamine.

Acid digests of seven-day composites of food, feces, and urine were prepared according to the procedure of Stearns (10) and analyzed for nitrogen by the Gunning-Arnold modification of the Kjeldahl method (11). The nitrogen content of any medicine or drugs taken by the patients was determined by analysis and calculated with the nitrogen intake. Sputum collections were not made since preliminary analyses of seven-day composites indicated no measurable loss of nitrogen in the sputum.

On the seventh day of the balance period, a test dose of 3 mg. riboflavin and 3 mg. thiamine was given orally, and the vitamin content of the following 24-hr. urine was determined. The percentage return of the test dose was calculated from the ratio between the urinary excretion following the test dose and the total intake for that day.

Roentgenologic examinations were made following the preliminary period and periods of restricted and high milk intakes. Accessory biochemical tests included measurements of hemoglobin, red blood cell counts, urinary creatinine, and urinary excretions of a test dose of 400 mg. ascorbic acid which was administered simultaneously with the test dose of riboflavin and thiamine.

RESULTS AND DISCUSSION

Physical characteristics of the subjects and their average caloric intakes during the study are summarized in Table 1. The ages varied from twenty-five to forty years. Body weights remained constant except for R.H. who gained 3 kg. during Periods 3 and 4. Only one subject, D.W., was considered underweight. The average daily caloric intake for the patients on their usual diet was 1996 calories. This decreased to 1730 calories for Periods 1 and 2 and increased to 2142 calories during Periods 3 and 4.

The range of hemoglobin values for the six subjects for the four experimental periods was from 11.8 to 14.8 gm. per 100 cc. and the mean was 13.6 gm. The average erythrocyte count was 4.52 million per cubic millimeter, and the range of values was from 3.71 to 5.19. These values are within the range reported by Ohlson (12) for healthy women. The mean values for the urinary excretion of creatinine were constant for each individual during successive periods. All values were within the range of 0.89 to 1.48 gm. per 24 hr., which was the range observed by Smith (13) for urinary excretion of creatinine by six healthy women.

The urinary excretion of ascorbic acid by tuberculous patients has been found to be lower than for healthy individuals (14, 15). For this reason, a supplement of 300 mg. ascorbic acid was given to the subjects daily. From previous work (16), it might be expected that this intake would be adequate for the subjects and that the 24-hour urinary excretion of a test dose of 400 mg. would be within 25 to 85 per cent of the dose, comparable to that for healthy women. The mean values for the subjects were 57, 64, 54, and 60 per cent, respectively, for the four periods and, therefore, were within the range for healthy women.

TABLE 1

Age, height, weight, and average caloric intakes of six women with active tuberculosis

SUBJECT	AGE	HEIGHT	WEIGHT*	AVERAGE DAILY CALORIC† INTAKE		
				Preliminary	Periods 1 and 2	Periods 3 and 4
	years	*cm.*	*kg.*			
S. W.	26	159	52.7	1856	1416	1988
R. H.	25	172	59.1	2612	1920	2318
M. G.	33	158	58.2	1722	1678	1803
G. B.	35	166	62.7	1968	1930	2479
F.	39	161	64.6	1866	1624	1942
D. W.	34	166	48.2	1952	1813	2326

* Initial weight.

† By calculation, Donelson and Leichsenring (32).

There was no evidence of intestinal tuberculosis among the subjects. Sputum tests were positive for the entire group during the experiment. Chest roentgenograms were stationary. The mean temperature at 3 P.M. was 98.6°F. ± 0.3°, and the fluctuations in daily temperature were not in excess of 2°. From these data, it was assumed that the tuberculosis was essentially afebrile. Since each experimental period was limited to three weeks, and since clinical tests failed to show progress or healing of the disease, it was not possible to relate the dietary routines to recovery from the disease.

Nitrogen Metabolism

The nitrogen intakes and balances for the preliminary test period and for the four experimental periods are given in Table 2. The range of values is given with the mean and its standard error. The average intake of the subjects on the usual diet was 10.1 gm. nitrogen. Because the milk intakes for the preliminary period were not controlled, these data were not used for statistical analyses.

Nitrogen retention data for Periods 1 to 4 were treated statistically by analysis of variance. Differences between means of periods of low and of high intakes were highly significant. However, when Periods 1 and 3 were compared with Periods 2 and 4, the difference between means was not significant. This indicated that riboflavin intake did not influence nitrogen retention under the conditions of the study. Therefore, it was possible to consider the nitrogen retention data independently of variations in dietary riboflavin.

The average nitrogen intake for the first two experimental periods was 8.88 gm. and for the last two periods, 13.31 gm. A decrease in nitrogen retention was observed for Periods 2 and 4 when compared respectively with Periods 1 and 3; however, this

TABLE 2

Retentions of nitrogen by six women with active tuberculosis

DIET PERIOD	NITROGEN			
	Intake		Retention	
	Average	Range	Average	Range
	gm./24 hr.	*gm./24 hr.*	*gm./24 hr.*	*gm./24 hr.*
Preliminary study—usual diet	10.10 ± 0.56*	9.00–12.27	0.65 ± 0.44*	−0.46–1.88
Period 1—300 gm. milk daily	8.90 ± 0.38*	7.57– 9.88	1.15 ± 0.20*	0.51–1.78
Period 2—300 gm. milk and 5 mg. riboflavin daily	8.85 ± 0.49*	6.55–10.04	0.57 ± 0.38*	−1.16–1.28
Period 3—1200 gm. milk daily	13.00 ± 0.59*	10.48–14.31	1.95 ± 0.29*	1.01–3.21
Period 4—1200 gm. milk and 5 mg. riboflavin daily	13.62 ± 0.51*	12.27–15.38	1.48 ± 0.40*	0.17–2.53

* Standard error of the mean.

decrease was not significant ["t" test, Fisher (17)]. All subjects were in equilibrium or retaining nitrogen at intakes of 10.00 gm. or higher. Menstrual losses of nitrogen by the subjects were not calculated with total nitrogen excretions, although these losses were determined and found to vary from 0.02 to 0.07 gm. daily.

A scatter diagram of the individual data for nitrogen intake and retention expressed as grams per day is shown in Figure 1. In addition, a line showing the regression of nitrogen retention in relation to intake has been drawn from the predicting equation reported by McKay and co-workers (18) from studies of 124 midwestern college women. The relationship of nitrogen intake and retention for the tuberculous subjects apparently was similar to that for healthy women, since the experimental data are distributed uniformly about the line. Data from McKay's study were selected for comparison with these data, since the ranges of nitrogen intakes were similar and, in both studies, diets were composed of mixed foods typical of the previous dietary habits of the subjects. The nitrogen intake values predicted for equilibrium by Hegsted (19) for adults and by Bricker (20) for college women were lower than the predicted value reported by McKay; however, these authors studied nitrogen retention and intake relationships in the region of negative rather than positive balances. The graph in Figure 1 indicates that the intake and retention relationship was linear for positive as well as negative retentions and that there was an increased retention at higher intakes for both groups.

The data given in Table 2 confirm the early studies of McCann (21) which indicated that the requirement of nitrogen for equilibrium by tuberculous patients is similar to that of healthy individuals. However, an intake of protein adequate to permit retention of nitrogen and tissue repair apparently is desirable for the tuberculous patient, although there is no evidence as to how much storage is desirable. Therefore, the protein need of these patients has been estimated at an amount which appears to be nutritionally adequate and which constitutes a practical recommendation from the standpoint of menu planning, cost, and acceptability of the diet. These data indicate that an intake of 80 gm. protein (12.8 gm. nitrogen) daily should provide for regular storage of nitrogen for the tuberculous woman. This is an amount which an inactive woman could be expected to consume day after day during the extended period of illness characteristic of this disease.

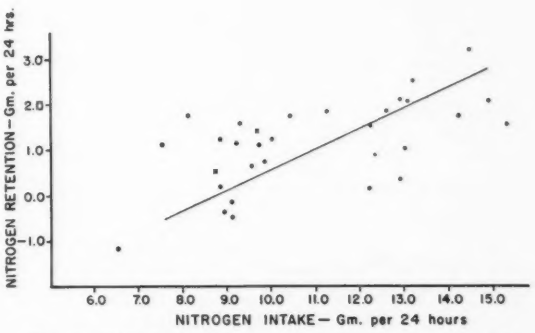

FIG. 1. *Distribution of nitrogen retention data for tuberculous women about regression line predicted by McKay (18) from values for healthy women.*

Riboflavin Metabolism

The data on riboflavin metabolism are given in Table 3. There was a wide range of intakes for the preliminary test period since some patients received vitamin supplements containing riboflavin. Periods 1 and 3 were periods of moderate riboflavin intake. The mean intake for Period 1 was 1.35 mg. and the mean excretion of riboflavin in the urine was 23 per cent. For Period 3, the dietary riboflavin was 2.60 mg., and the daily excretion represented 42 per cent of this amount. Periods 2 and 4 were periods of high riboflavin intakes. The daily average intake for Period 2 was 6.41 mg., and the percentage excretion in the urine was 55; for Period 4, with a daily average intake of 7.79 mg., 72 per cent of the intake

TABLE 3

Intakes and excretions of riboflavin by six women with active tuberculosis

DIET PERIOD	RIBOFLAVIN							
	Intake		Urinary excretion		Test dose response		Fecal excretion	
	Average	Range	Average	Range	Average	Range	Average	Range
	mg./24 hr.	*mg./24 hr.*	*mg./24 hr.*	*mg./24 hr.*	%	%	*mg./24 hr.*	*mg./24 hr.*
Preliminary study—usual diet	7.21 ± 1.36*	1.83–9.37	4.83 ± 1.17*	0.60–7.24	60 ± 7	23–74	0.94 ± 0.06*	0.78–1.07
Period 1—300 gm. milk daily	1.35 ± 0.06*	1.18–1.47	0.31 ± 0.04*	0.20–0.45	39 ± 5	26–62	0.68 ± 0.10*	0.27–0.99
Period 2—300 gm. milk and 5 mg. riboflavin daily	6.41 ± 0.08*	6.21–6.68	3.53 ± 0.49*	1.08–4.29	65 ± 6	41–82	0.68 ± 0.08*	0.37–1.00
Period 3—1200 gm. milk daily	2.60 ± 0.09*	2.23–2.89	1.08 ± 0.07*	0.88–1.29	55 ± 3	42–64	0.83 ± 0.07*	0.60–1.00
Period 4—1200 gm. milk and 5 mg. riboflavin daily	7.79 ± 0.05*	7.56–7.93	5.62 ± 0.63*	3.47–7.08	72 ± 7	43–88	0.87 ± 0.08*	0.61–1.14

* Standard error of the mean.

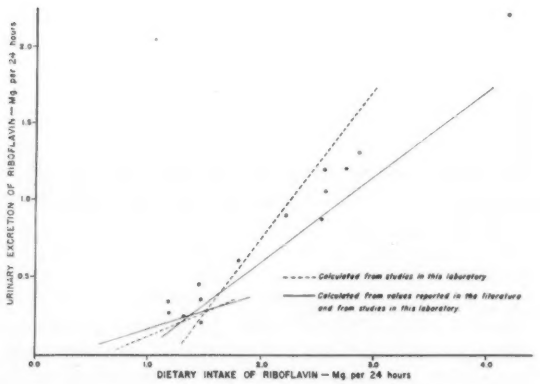
URINARY EXCRETION OF RIBOFLAVIN — Mg per 24 hours
DIETARY INTAKE OF RIBOFLAVIN — Mg per 24 hours
Calculated from studies in this laboratory
Calculated from values reported in the literature and from studies in this laboratory

FIG. 2. *Distribution of values for intake and urinary excretion of riboflavin by tuberculous women about regression lines predicted by Brewer (22) from values for healthy women.*

was excreted in the urine. The mean test dose responses were 39 and 55 per cent for Periods 1 and 3 and 65 and 72 per cent for Periods 2 and 4.

Comparative values for measurements of excretions following a test dose under similar conditions are available for healthy women only at the lower riboflavin intakes of Periods 1 and 3. The average excretion of a 3-mg. test dose for nine college women with a dietary intake of 1.6 mg. riboflavin was 31 per cent with a range of 26 to 38; the per cent excretion for four women at a dietary intake of 2.73 mg. was 55 with a range of 51 to 60 (22). Thus values for tuberculous subjects in Periods 1 and 3 were similar to those for healthy women with slightly higher riboflavin intakes.

A comparison of daily urinary excretions of riboflavin by the six tuberculous patients with those of healthy women is shown in Figure 2. The regression lines were drawn from predicting equations which were reported previously (22) and which were calculated from riboflavin intake and excretion data from the literature and from studies in this laboratory. The two predicting equations were calculated from riboflavin intakes of 0.5 mg. to 2.0 mg. and from riboflavin intakes of 1.3 mg. and above. The scatter diagram of the individual data for the tuberculous patients at riboflavin intakes between 1.0 and 4.0 mg. daily has been superimposed on the graph. Values at the higher riboflavin intakes were not plotted, since these values were without the range of experimental data for which the regression lines were calculated and extrapolation of these lines to the higher intakes was not justified. The values do not vary from patterns established for healthy women as preliminary studies indicated, although values at the lower riboflavin intakes are grouped above rather than about the regression lines.

Fecal excretions were higher for periods of increased milk intake than when the milk was restricted. The average fecal excretion for Periods 1 and 2 was 0.68 mg. and for Periods 3 and 4, 0.85 mg. per 24 hr. The addition of riboflavin supplement to the diet had no apparent effect on fecal excretion of the vitamin.

The data were examined statistically to determine whether an interrelationship of nitrogen and riboflavin metabolism could be demonstrated in tuberculosis. The correlation coefficient between nitrogen retention and urinary excretion of riboflavin within periods was found to be -0.487 ($P < 0.05$) by analysis of covariance. By this analysis, the effects of variations in intake were removed from the total correlation. The correlation coefficient between nitrogen retention and the response to a test dose of riboflavin within periods was -0.543 ($P < 0.02$).

TABLE 4

Intakes and excretions of thiamine by six women with active tuberculosis

DIET PERIOD	THIAMINE							
	Intake		Urinary excretion		Test dose response		Fecal excretion	
	Average	Range	Average	Range	Average	Range	Average	Range
	mg./24 hr.	*mg./24 hr.*	*mg./24 hr.*	*mg./24 hr.*	%	%	*mg./24 hr.*	*mg./24 hr.*
Preliminary study—usual diet	6.36 ± 3.45*	0.65–8.84	2.24 ± 1.44*	0.12–3.63	26 ± 8.3	18–38	1.98 ± 1.31*	0.67–3.91
Period 1—300 gm. milk daily	0.66 ± 0.12*	0.53–0.86	0.15 ± 0.07*	0.07–0.27	12 ± 5.3	7–21	0.37 ± 0.20*	0.06–0.56
Period 2—300 gm. milk and 5 mg. riboflavin daily	0.76 ± 0.12*	0.53–0.90	0.14 ± 0.06*	0.06–0.21	12 ± 3.2	7–15	0.35 ± 0.15*	0.12–0.51
Period 3—1200 gm. milk daily	0.80 ± 0.12*	0.59–0.94	0.16 ± 0.04*	0.11–0.21	18 ± 4.0	12–23	0.34 ± 0.06*	0.10–0.50
Period 4—1200 gm. milk and 5 mg. riboflavin daily	0.70 ± 0.15*	0.42–0.80	0.17 ± 0.05*	0.08 0.25	18 ± 2.3	15–21	0.43 ± 0.14*	0.23–0.66

* Standard error of the mean.

TABLE 5

Urinary excretion of thiamine by women with active tuberculosis and healthy women

RANGE OF INTAKE	TUBERCULOUS WOMEN		HEALTHY WOMEN	
	Number	Urinary excretion	Number	Urinary excretion
mg./24 hr.		*mg./24 hr.*		*mg./24 hr.*
0.40 to 0.59	5	0.12	25	0.04
0.60 to 0.69	3	0.14	7	0.04
0.70 to 0.79	10	0.17	9	0.06
0.80 to 0.99	6	0.16	21	0.18

These values indicated that an inverse relationship existed between nitrogen retention and urinary excretion of riboflavin for the tuberculous patients. The increased excretion of riboflavin apparently results from failure of the liver to retain riboflavin when nitrogen retention is negative since animal studies have shown that liver storage of riboflavin was dependent upon nitrogen intake (1, 23). Therefore, an estimation of the dietary requirement of riboflavin of an individual must be based upon the assumption that the nitrogen intake is adequate.

Since urinary excretion of riboflavin is closely related to the dietary intake, it is difficult to establish the minimum riboflavin requirement from intake and excretion values. The minimum requirement undoubtedly is low since subjects have been maintained on intakes of 0.287 mg. daily for nearly six months without measurable handicap (24). An amount above the minimum, however, probably is necessary for tissue reserves. Several investigators have observed that urinary excretions of riboflavin at restricted intakes indicated depletion of tissue supplies (24–26). The individuals studied in this investigation were adult women with the added metabolic stress of chronic illness. The data presented have been interpreted in terms of intakes adequate to maintain tissue reserves.

Values for the percentage excretion of a test dose of riboflavin in Period 1 were somewhat lower than for other periods. Whereas the intake for this period, 1.35 mg., may have been adequate for tissue supplies for four of the subjects, it probably was not adequate for subjects G.B. and M.G. for whom test dose responses (26 and 30 per cent, respectively) were appreciably less than for succeeding periods. However, values for Period 3 were comparable to values for periods of high riboflavin intake, and there was no apparent advantage from intakes above 2.6 mg. It is possible that an intake above 1.35 mg. but less than 2.6 mg. would be adequate but there are no data within this range of intake.

Thiamine Metabolism

The intakes and excretions of thiamine for these subjects are given in Table 4. The intake of thiamine was relatively constant during the four experimental periods since variations of the milk ingested had little effect on the thiamine intake. The high average intake of thiamine for the preliminary period resulted from vitamin supplements containing thiamine. The mean thiamine intake varied from 0.35 mg. per 1000 calories for Periods 3 and 4 to 0.41 mg. per 1000 calories for Periods 1 and 2. This intake is above the minimal daily requirement of 0.25 to 0.30 mg. per 1000 calories which was estimated by Daum (27) for young adult women, but is less than the dietary allowance of 1.0 mg. per day recommended by the Food and Nutrition Board of the National Research Council.

In Table 5, thiamine excretions for the six experimental subjects have been grouped according to

dietary intake, and a comparison has been made with thiamine excretions for healthy women studied in this laboratory and reported in the literature (28–31). Higher values for urinary excretion of thiamine were observed among the tuberculous patients at intakes less than 0.8 mg. daily. However, for intakes between 0.8 and 1.0 mg. daily, the urinary thiamine values were similar to those for healthy individuals. Test dose responses for the tuberculous patients were similar to those observed for college women in this laboratory. Analysis of covariance failed to show an interrelationship of thiamine excretions with either nitrogen retention or urinary riboflavin excretions.

The data which have been presented indicate that the metabolism of nitrogen, riboflavin, and thiamine of women with moderately advanced, active tuberculosis is similar to that of women free from the disease. These data indicate further that the quantity of these nutrients required by tuberculous patients may be supplied by an adequate diet of natural foods if the diet contains generous amounts of meat, milk, and cereals.

The dietary problem in tuberculosis with respect to these nutrients would appear to focus on the discrepancies which may exist between the diet as served to the patient and the quantity of food which is actually eaten. In an earlier publication (16), the results of a dietary survey of sanatorium patients were reported. Food records of thirty women patients indicated caloric intakes which ranged from 1200 to more than 3000 calories daily. More than 60 per cent of the women reported food intakes which supplied less than 80 gm. protein daily, and 35 per cent reported daily food intakes which supplied less than 60 gm. even though the sanatorium diet was generous in all respects. It, therefore, is apparent that if the patient practices free selection of food from the meals which are served, the diet which she consumes may be inadequate. It seems equally apparent that the patient must be taught the essentials of a good diet and encouraged to eat quantitatively the food which is served, if good nutrition is to be achieved.

SUMMARY

The riboflavin, nitrogen, and thiamine metabolism of six women with moderately advanced, active tuberculosis was studied. The riboflavin and nitrogen content of the usual hospital diet was varied by adjustment of the milk intake and by the addition of riboflavin supplements. Retentions of nitrogen by the tuberculous women were similar to those of healthy women at comparable intakes. All subjects were in nitrogen equilibrium or retaining nitrogen on intakes above 10.00 gm. daily.

The average daily intakes of riboflavin for the four experimental periods were 1.35, 6.41, 2.60, and 7.79 mg. respectively. Average daily urinary excretions were 0.31, 3.51, 1.08, and 5.62 mg. riboflavin. The urinary excretion of riboflavin varied inversely with nitrogen retention.

The urinary excretion of riboflavin and of thiamine by the tuberculous patients was similar to that of healthy young women at similar intakes.

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New Sources of Soil Nitrogen Discovered

Forecasters predicting world starvation on the theory that the soil is running out of nitrogen are reckoning without the aid of nitrogen-converting bacteria found in the soil, according to Drs. P. W. Wilson and R. H. Burris of the University of Wisconsin. At the 118th national meeting of the American Chemical Society held in Chicago in September, these investigators reported that in the last year more nitrogen-converting bacteria have been discovered than in all the time since the conversion process became known in the 1880's.

That bacteria convert nitrogen from the air into nitrogen soil compounds to replace those withdrawn by animals and plants in building protein has long been known. However, it has been thought that there are only a few organisms which have developed mechanisms through which they convert atmospheric nitrogen into protein. These include leguminous plants (peas, beans, clovers, and alfalfa), soil bacteria called azotobacter and clostridium, and blue-green algae, or nostoc. Algae are a family of plants including sea weed and other green growths in water.

Up to this time, accepted calculations have indicated that the soil cannot continue indefinitely to support life at the present rate, for experts have estimated that our nitrogen account in the soil is constantly in the red, and that we are annually drawing on nitrogen soil reserves in spite of the great expansion in the commercial nitrogen fixation plants. However, the Wisconsin workers report that the experts have calculated too few bacteria and too few plants capable of nitrogen-conversion from the air. Thus the predicted reduction in food supplies may not come to pass.

Their report pointed out that two basic processes allow animal survival—photosynthesis and biologic nitrogen fixation. Photosynthesis is the chemical action of sunlight, and its importance is generally recognized. Nitrogen fixation is the conversion of atmospheric nitrogen into nitrogen soil compounds, and its significance has attracted much less attention, except among agricultural scientists.

For years researchers have worked on two problems: one, what is the relationship, if any, between nitrogen fixation and photosynthesis? The existence of a relationship is suggested by the fact that both processes occur in two types of photosynthetic organisms—the leguminous plants and the algae. Two, is nitrogen fixation restricted to the enumerated species, or is it more widespread in nature? The answer to this last question is related to the problem of the standard of living and how large a population a given area can be expected to support.

By using tracer techniques with the heavy isotope of nitrogen, Drs. Wilson and Burris found that a certain photosynthetic bacterium would fix nitrogen. They tried bacteria from all three families of the known photosynthetic types, and fixation was demonstrated in all three, thus bringing to light new genera of these useful bacteria. The complete significance of these new types cannot be evaluated as yet, but obviously a new factor has been uncovered that must affect calculations and speculations on the ability of the soil to support populations.

Nutritional Status Survey, Groton Township, New York

III. Nutrient Usage as Related to Certain Social and Economic Factors[1]

ODIN WILHELMY, JR., CHARLOTTE M. YOUNG, and HELEN L. PILCHER[2]

School of Nutrition, Cornell University, Ithaca, New York

TWO previous papers in this series have served to present the general plan and scope of this nutritional status survey, a description of the survey sample, and certain basic data concerning nutrient usage among cooperating families and individuals (1, 2). In this paper the relationship of nutrient usage to certain social and economic characteristics of the participants will be presented and discussed.

The fundamental importance and value of obtaining an adequate record of the socio-economic background of the individuals taking part in any comprehensive study of nutritional status should not be underestimated. Such information serves to provide a sound descriptive base to the survey, thereby permitting a more accurate and intelligent evaluation of the results. Of more importance, however, is the fact that such data offer a basis for any educational or corrective action which may be undertaken as a follow-up to the survey. Dietary records, blood analyses, and medical inspections supply the information necessary for an overall general picture of the nutritional well-being of a given group or community. Socio-economic data supplement this picture and furnish an opportunity for more thorough analysis of the nutritional data, with a view to learning the basic causes of the nutritional pattern.

In presenting these relationships it should be emphasized again that the economic conditions which prevailed in this country in the 1930's and exerted a strong influence on the dietary patterns of that period no longer exist for the majority of our population. Undeniably food costs have risen to a high level in the past decade, but consumer incomes have risen to an even greater extent. As a result, the ratio of food costs to income has declined significantly. The average consumer still spends a considerable share of his income for food; but for the same percentage of his income today he is getting not only larger quantities of food, but also a larger proportion of the more expensive, and in general more nutritious foods.

As a result, the nutritional status of the average consumer today has improved considerably over what it was fifteen years ago, and the widespread malnutrition prevalent then is no longer evident. There are still many individuals whose diets are in need of improvement, but surveys of food consumption in recent years indicate that the number of such persons and the degree of dietary deficiency have decreased significantly.

A second effect of this increase in consumer income has been to obscure certain relationships which one would normally expect to find in a study such as this. In certain instances—for example, income as related to education—no relationship could be established; in others, the relationship which did exist was rather indefinite. Such a situation is not surprising in a period of economic prosperity, but its existence must be recognized.

COLLECTION AND PROCESSING OF SOCIO-ECONOMIC INFORMATION

The manner in which the socio-economic data were collected has been described briefly (1). This was accomplished by visiting the home of each family cooperating in the survey and interviewing a member of the family, usually the housewife. Information was obtained on the composition of the family, age and education of each individual, country of birth of the parents and grandparents, household conveniences, occupation, income, and home-produced food. In the case of farm families, further information concerning the nature and size of the farm enterprise was also obtained.

With the exception of income and home-produced food, the nature of the data gathered in these inter-

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views is self-evident. Family income for the village families in this study represents total cash earnings during 1948 by all members of the family, before taxes or other deductions, whether from full-time or part-time jobs—plus income from other sources, such as insurance, pensions, rent, or dividends.

It was apparent from the outset that the income of farm families could not be determined in so simple a manner because of the rather complex intermingling of income and expenditures in a normal farm business. It was not practical, either from the standpoint of available time or personnel or from that of obtaining adequate cooperation from the farm group, to undertake a complete recording of the financial aspects of the several farm enterprises. Fortunately, an acceptable alternative existed in the form of extensive income data relating to comparable farm businesses in neighboring townships, obtained in the summer of 1948 in a farm management survey (3). By means of multiple correlation analysis, an equation was evolved to represent the relationship of farm income plus privileges to the factors of size of business and productivity of these farms. Using this equation and assuming that a farm of similar size and productivity in Groton Township would have a similar income pattern, income for 1948 for each farm family was calculated. Income for those families among the rural non-farm group who had a farm enterprise of any magnitude was determined by a combination of the methods used for the farm and village families.

In the case of home-produced foods, the principal difficulties encountered lay in the collection rather than in the processing of the data. Each family was questioned about its home production of fruits, vegetables, and livestock products for the entire year, both as to quantities of each food produced and the form—fresh, frozen, or canned—in which it was used. Particularly for fruits and vegetables this involved considerable dependence on the housewife's memory. However, with some urging, it was possible to elicit estimates of the quantity of food produced at home by each family for its own use which were presumably as reliable as could be obtained in a survey of this nature. Subsequently, these physical quantities were converted to a dollar-value basis using retail value per pound as the conversion factor in each instance.

RELATION OF NUTRIENT AVAILABILITY TO SELECTED SOCIAL AND ECONOMIC FACTORS

The volume of data accumulated in a survey of such broad scope as this makes possible an analysis and discussion of a rather large number of relationships. Limitations of space require that only the more significant of these relationships, whether positive or negative, be presented and discussed here. The nutrient data employed for the purposes of this analysis are based on the one-week family food purchase records. As such, the data represent nutrients available to each family for consumption at home rather than actual intake. It must further be recognized throughout the discussion that the relationships in question are based on averages for groups of families—averages from which the individual family may deviate significantly.

AVERAGE MONEY VALUE OF FOOD PER WEEK AND PER FOOD EXPENDITURE UNIT MEAL

In both the fall and spring, the money value of food available at home per week was significantly greater for the average farm family than it was for the average family in either the rural non-farm or village groups. In the fall, average money value of food available at home per week was $27.96 for farm

TABLE 1

Weekly income and availability of nutrients as related to average money value per food expenditure unit meal

AVERAGE MONEY VALUE PER FOOD EXPENDITURE UNIT MEAL	WEEKLY INCOME PER FOOD EXPENDITURE UNIT	NUMBER OF FAMILIES	NUTRIENTS AVAILABLE PER NUTRITION UNIT								
			Energy	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
All Families, Fall of 1948											
			calories/day	*gm./day*	*mg./day*	*mg./day*	*I.U./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*
Under $0.30	$25.38	89	2,817	79.1	884	13.7	8,383	1.83	2.12	17.8	112
$0.30–0.39	32.23	81	3,436	98.3	1,040	17.1	11,284	2.10	2.56	21.7	134
0.40–0.49	30.04	25	4,256	115.7	1,265	21.5	14,480	2.65	2.87	25.5	154
0.50 and over	37.85	13	4,148	133.2	1,390	23.2	13,923	2.79	3.35	28.8	209
All Families, Spring of 1949											
Under $0.30	$23.94	81	2,929	79.9	839	14.0	6,732	1.87	2.11	18.7	108
$0.30–0.39	30.57	54	3,418	97.4	1,037	16.9	8,211	2.07	2.53	21.6	132
0.40–0.49	36.21	24	4,310	126.1	1,207	21.7	9,042	2.81	3.12	28.8	172
0.50 and over	43.71	7	4,853	167.3	1,740	29.4	14,971	3.67	4.02	34.3	255

families, $19.86 for rural non-farm families, $19.43 for village families, and $21.44 for all families. The comparable figures for the spring were $26.20, $19.07, $19.85, and $20.93. Because of the larger average size of family among the farm group, this advantage of the farm family was somewhat less when calculated on a food expenditure unit basis.

These differences were reflected in the average money value per food expenditure unit meal for families in each of the residential groupings. This value was determined for each family by calculating the total number of equivalent food expenditure unit meals for the household for the week and dividing the aggregate money value of the food available during the week by this total (4). The resulting average money value per food expenditure unit meal in the fall was $0.352 for the farm group, $0.320 for the rural non-farm participants, $0.312 for village families, and $0.325 for all families. The comparable figures in the spring were somewhat lower—$0.324, $0.316, $0.315, and $0.317.

The quantities of the several nutrients available per nutrition unit were closely correlated with money value per food expenditure unit meal, as is apparent in Table 1. As money value per food expenditure unit meal increased, nutrient availability increased similarly. Only in the group where money value per food expenditure unit meal was less than $0.300 was there any evidence of a nutritional deficit, relative to Recommended Dietary Allowances, and then only for calories and calcium. This deficit in the case of calcium may actually have been less than was apparent if one makes allowance for the current belief that most food composition tables in use today tend to undervalue the calcium content of manufactured foods.

It was apparent that the nutritive value of the diet of the average family in the survey was essentially a reflection of the dollar-value of the food consumed. There is some evidence that families in which the money value of food per food expenditure unit meal was low were more judicious in their food expenditures, as will be apparent in the discussion of family size; but this finding is subordinate to the primary relationship of cost of diet to nutritive value.

The clear-cut relationship of nutrient availability to money value per food expenditure unit meal and the data of the preceding paragraph can be combined to give an initial clue to the underlying basis of the superiority of diets among the farm families noted in the second paper of this series (2). The average farm family enjoyed a more costly diet than did the average rural non-farm or village family, and this more costly diet translated itself directly into greater average nutrient usage.

One may naturally question whether the high nutrient availability figures among farm families are not at least in part indicative of considerable food wastage. The high average caloric intake figures particularly lend support to such a conclusion and a wastage of other nutrients would logically accompany wastage of calories, although probably not in the same proportion. Certainly this was the case for individual families and probably for farm families in general to a lesser degree, but not to an extent sufficient to destroy the basic relationship among the three residential groups.

SIZE OF FAMILY

The relationship of nutrient usage to family size is a close corollary of the foregoing relationship of nutrient usage to the money value of family diets. The primary effect of increasing family size on the family food pattern was a reduction in the amount of money spent for food per person. It is apparent from Table 2 that as family size, expressed in terms

TABLE 2

Weekly income, average money value per food expenditure unit meal, and availability of nutrients as related to size of family

FOOD EXPENDITURE UNIT	WEEKLY INCOME PER FOOD EXPENDITURE UNIT	AVERAGE MONEY VALUE PER FOOD EXPENDITURE MEAL	NUMBER OF FAMILIES	NUTRIENTS AVAILABLE PER NUTRITION UNIT								
				Energy	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
All Families, Fall of 1948												
				calories /day	*gm./day*	*mg./day*	*mg./day*	*I.U./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*
Under 2.0	$43.08	$0.345	36	3,356	93.8	1,007	16.1	9,942	1.96	2.24	19.0	130
2.0–2.9	32.79	0.360	52	3,407	103.9	1,089	18.1	11,733	2.19	2.68	23.2	144
3.0–3.9	27.14	0.316	59	3,414	93.0	998	16.5	10,300	2.18	2.44	21.3	132
4.0 and over	20.59	0.290	61	3,114	87.9	996	15.7	10,285	2.02	2.41	19.8	122
All Families, Spring of 1949												
Under 2.0	$48.57	$0.369	28	3,649	102.3	1,058	17.3	7,854	2.24	2.45	20.3	150
2.0–2.9	30.75	0.350	44	3,531	104.0	1,048	18.1	8,318	2.25	2.66	23.4	143
3.0–3.9	25.08	0.297	47	3,288	94.1	968	17.0	8,338	2.16	2.49	22.4	130
4.0 and over	18.57	0.276	47	3,132	86.4	933	14.8	7,079	1.99	2.30	20.4	114

of food expenditure units, increased, both weekly income per food expenditure unit and average money value per food expenditure unit meal declined. This decline was reflected in the nutrient availability in all three residential groupings in both seasons.

Several exceptions to this general rule are worthy of note, however. The progressive decrease in average money value per food expenditure unit meal, and as a consequence in nutrient usage, was much more irregular among farm and rural non-farm families than among village families. Secondly, the high level of food expenditures among families in the 2.0- to 2.9-food expenditure unit class may have been a reflection of a greater interest in diet among these families—most of them comprised of a husband and wife and one child. Finally, there is a clear indication in the data that larger families tended to use their food dollars more thriftily than did small families. A simple division of average nutrient availability figures by the corresponding average value per food expenditure unit meal reveals a regular and significant increase in nutrients furnished per dollar spent for food as one moves from small to large family groups.

HOME-PRODUCED FOOD

All the analyses of the data made thus far indicate that home-produced food played an important role in determining the dietary patterns of the participating families. This being the case, an examination of this aspect of the study is in order.

Types of Products Raised for Home Use

The major producers of food for home consumption were the farm families, but the number of families in the other two residential categories who raised at least some of their own food was considerable. All but 3 of the 46 farm families raised fruits, vegetables, and livestock products—the remaining 3 lacked only fruit. Ninety per cent of the 74 rural non-farm families raised vegetables, 70 per cent had home-grown fruit, and slightly over half raised livestock products. Forty per cent of this group produced food in all three classes, while only 2 rural non-farm families had no home food production. Three-fifths of the 103 village families had vegetable gardens, two-fifths raised fruit or berries, and one-tenth raised livestock products. About one-fourth of the village families raised no fruit, vegetables, or livestock products.

In terms of livestock products, milk, eggs, and chickens were the most commonly produced. Only 1 farm lacked a cow, while nearly 40 per cent of the rural non-farm families and 2 families in the village kept a cow. About 85 per cent of the farm families, 35 per cent of the rural non-farm families, and 8 per cent of the village families had home-produced chickens and eggs. Thirty of the farm families raised their own pork and 24 their own beef, with the comparable figures in the rural non-farm group being 15 and 9, and in the village 7 and 4, the latter figures including gifts of pork or beef from rural neighbors. Only 1 farm family in 4 made cream, butter, or cheese from home-produced milk, while 3 out of 4 of the rural non-farm families who kept a cow converted a portion of the milk to other dairy products.

Money Value of Home-Produced Food

It is clearly evident that the farm families produced far more food for home use than did rural non-farm or village families, on a dollar-value basis as well as a varietal basis. The average retail value of all products raised during 1948 for home use per family raising such products was $885 for the farm group, $301 for rural non-farm families, and $87 for village families. The comparable median values were $800, $200, and $50, respectively. If the figures were calculated for all families in each of the residential groups, these differences would be even greater.

Home-Produced Food as a Percentage of Annual Food Consumption

Another measure of the importance of home-produced food in the diets of these families is that obtained by expressing total dollar-value of home-produced food as a percentage of the estimated annual value of diet for each family. The latter figure was obtained by assuming that the money value of food available to each family during the one-week survey period was typical of that family's diet over the year, and multiplying the one-week total by 52. Recognizing the weakness inherent in this assumption, the significance of the role played by home-produced food in the diets of many of the participating families is still apparent in the following data. For those families who raised at least a part of their own food, the average percentage of annual food expenditure represented by the total dollar-value of all home-produced food was 61 per cent for the farm families, 29 per cent for rural non-farm families, and 11 per cent for village families. The corresponding median values were 58, 24, and 7. There was no apparent relationship between the dollar-value of food raised for home use by a family and the cash income of that family.

Nutrient Usage as Related to Money Value of Home-Produced Food

One of the most interesting relationships noted was that which existed between nutrient usage and the dollar-value of home-produced food. In Table 3 is shown the nature of this relationship for the total survey sample. The same relationship held for each of the residential groups as well.

Both in the fall and spring, as dollar-value of home-produced food per food expenditure unit increased, money value per food expenditure unit meal rose simultaneously; and the latter increase was reflected

TABLE 3

Weekly income, average money value per food expenditure unit meal, and availability of nutrients as related to dollar-value of home-produced food

DOLLAR VALUE OF HOME-PRODUCED FOOD PER FOOD EXPENDITURE UNIT	WEEKLY INCOME PER FOOD EXPENDITURE UNIT	AVERAGE MONEY VALUE PER FOOD EXPENDITURE UNIT MEAL	NUMBER OF FAMILIES	NUTRIENTS AVAILABLE PER NUTRITION UNIT								
				Energy	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
All Families, Fall of 1948												
				calories/day	*gm./day*	*mg./day*	*mg./day*	*I.U./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*
Under $20	$30.21	$0.301	76	2,988	83.9	884	14.4	8,845	1.87	2.12	18.7	120
$20– 99	32.61	0.322	56	3,386	93.0	956	17.0	11,262	2.07	2.36	21.5	126
100–199	22.50	0.319	34	3,474	98.2	1,121	17.6	11,174	2.20	2.63	21.2	137
200 and over	28.79	0.375	38	3,725	114.0	1,292	19.7	12,576	2.50	3.16	24.4	156
All Families, Spring of 1949												
Under $20	$32.18	$0.307	59	3,235	88.7	873	14.9	6,480	1.94	2.20	20.7	129
$20– 99	29.75	0.315	44	3,420	93.7	939	16.8	8,423	2.15	2.34	21.4	136
100–199	25.28	0.316	28	3,392	102.8	1,094	17.7	8,818	2.35	2.71	22.6	129
200 and over	23.13	0.342	31	3,560	108.1	1,236	19.4	9,345	2.37	3.01	23.5	133

TABLE 4

Average money value per food expenditure unit meal and availability of nutrients as related to weekly income

WEEKLY INCOME PER FOOD EXPENDITURE UNIT	AVERAGE MONEY VALUE PER FOOD EXPENDITURE UNIT MEAL	NUMBER OF FAMILIES	NUTRIENTS AVAILABLE PER NUTRITION UNIT								
			Energy	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
All Families, Fall of 1948											
			calories/day	*gm./day*	*mg./day*	*mg./day*	*I. U./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*
Under $20	$0.294	63	3,321	91.3	1,018	15.9	9,303	2.02	2.42	20.8	116
$20–29	0.317	66	3,244	92.8	996	16.1	10,971	2.09	2.45	20.5	128
30–39	0.351	35	3,524	99.9	1,060	18.1	12,240	2.26	2.55	21.7	143
40 and over	0.360	44	3,244	96.7	1,034	17.1	10,557	2.08	2.45	21.0	151
All Families, Spring of 1949											
Under $20	$0.280	62	3,155	88.2	943	15.2	6,296	2.00	2.34	20.4	112
$20–29	0.314	46	3,365	96.7	1,019	16.6	9,730	2.16	2.57	21.8	139
30–39	0.374	21	3,883	113.1	1,122	20.7	8,024	2.52	2.85	25.8	142
40 and over	0.353	37	3,440	98.2	978	17.1	8,216	2.19	2.36	21.5	148

in the increasing availability of nutrients per nutrition unit. This phenomenon held true regardless of whether weekly income per food expenditure unit increased or not.

This relationship would appear to be the major underlying factor in explaining why the average farm family in this study enjoyed a better diet than the average rural non-farm family, and the latter in turn a better diet than the average village family. Production of food for home consumption was greatest among the farm families and least among village families, with the rural non-farm group intermediate —the same relative positions occupied by the three residential groups in terms of nutrient usage.

The principal reason for this influence of home-produced food on the quality of the diet is probably economic. A farm housewife who brings in a gallon of milk from the barn, if she thinks about the price of that milk at all, is much more likely to think in terms of the farm price, i.e., what income the milk would produce if it were sold. The housewife in a rural non-farm family where food production is not the basis of the family's economic life is even less likely to consider the price of the milk she gets from the family cow. A village housewife, however, is likely to be quite conscious of the price of milk—the retail price she pays for a quart of milk. The logical consequence of these divergent lines of reasoning regarding food costs is for the farm and rural non-farm families to eat more food and enjoy better diets, since the immediate out-of-pocket cost of these diets is considerably less than for the village families.

NUTRIENT USAGE AS RELATED TO FAMILY INCOME

While there was some tendency toward increased nutrient usage as weekly income per food expendi-

ture unit increased, the averages presented in Table 4 indicate that this relationship was not clear-cut. In both the fall and spring, families in the $30–$39 group showed the highest average nutrient usage. This lack of relationship between quality of diet and income does not refute relationships of this nature found in the dietary surveys of the 1930's. Rather it indicates that family incomes in general today are at a sufficiently high level that income is not at present a significant limiting factor in family food habits. This is not universally true, of course, but the majority of families in this country today are in the position of being able to purchase an adequate diet if they choose.

NON-EXISTENT RELATIONSHIPS

Certain instances in which no relationship was found between nutrient usage and a given socio-economic factor are worthy of note. There was no apparent relationship of average nutrient availabilities to age of either the husband or wife, to formal education of either the husband or wife, or to the nutrition education of the wife. There was likewise no consistent relationship of family income to either the age or education of the husband. Families in which the husband was between fifty and fifty-nine years of age had the highest average income in each residential group, but in other age groups the income pattern was quite irregular. Similarly in the farm and village groups, families in which the husband had some college training enjoyed average incomes somethat higher than families in which the husband was high-school educated; but so did families where the husband had received only a grade-school education.

In all these cases it is apparent that the high level of economic activity and the generally high incomes accruing to the survey families during 1948 were sufficient to obscure certain relationships which one would normally expect to find in less prosperous periods.

SUMMARY

The relationships of food habits and nutrient availabilities to certain social and economic factors for a group of rural families are presented and discussed.

Average availability of nutrients was closely correlated with the money value of the family diet, either on a food expenditure unit meal basis or on the basis of the total money value of food available. The average farm family consumed a more costly diet than did the average village family, with the rural non-farm family holding an intermediate position. These differences in money value of the diet were in turn reflected in nutritive value of the diet.

Nutrient availability per nutrition unit tended to decrease as the size of the family increased, principally as a result of a declining average money value per food expenditure unit meal.

Home-produced food exerted a strong influence on family dietary patterns. In terms of both variety and dollar-value of home-produced food or home-produced food as a percentage of annual food consumption, farm families ranked well ahead of rural non-farm families, and the latter in turn ahead of the village group. In all three residential groups, nutrient availability increased markedly as the dollar-value of home-produced food increased, whether family income increased simultaneously or not. This relationship would appear to be the fundamental factor underlying the higher quality of diet enjoyed by the average farm family.

No consistent relationship was found to exist between nutrient usage and family income, nor between nutrient usage and the factors of age or formal education of the husband or wife, or nutrition education of the wife. The high level of incomes among the participating families apparently acted to obscure these relationships.

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Thanksgiving

It was a woman who finally brought about the observance of a national Thanksgiving Day. Sarah Josepha Hale, Editor of *Godey's Lady's Book*, the popular women's magazine of the nineteenth century, had written editorials and appealed to presidents to set aside one day for Thanksgiving. George Washington set apart the last Thursday in November, 1789, for giving thanks, but it was Abraham Lincoln in 1863 who made it a national holiday.—*From "Background of New England Cooking" prepared by the Menu Committee (Alice Easton, Marie Casteen, Ellen Riley, and Mary Davidson) for the 31st Annual Meeting of the American Dietetic Association in Boston in 1948.*

Nutrition in Relation to Dental Health[1]

NEAL W. CHILTON, B.Sc., D.D.S., M.P.H.

Section on Dental Diseases, New Jersey Department of Health, Trenton, and Department of Pharmacology and Therapeutics, New York University, College of Dentistry

EXISTING knowledge of nutrition as it relates to dental and oral health is by no means complete, but enough facts are available to enable the interested person to assume a rational approach to this aspect of nutrition. Unfortunately, it has been extremely difficult at times to wade through the vast amount of literature on the subject and glean the pertinent information. Moreover, some of the concepts which have been advanced have been interpreted as conflicting with other concepts of nutrition. A good deal of emotion has often crept into discussions in this field. In this presentation, I should like to offer my views on the subject, with the hope that the ensuing discussion will enable you to obtain an overall, integrated picture of how the principles of good nutrition can be applied to the maintenance of the health of the oral tissues.

The teeth and other contents of the oral cavity are the parts of the body most intimately associated with the taking of food. It is, therefore, conceivable that the health of these structures can be affected by nutrition, not only as parts of the overall organism, but also by local factors which directly affect these masticatory organs (1).

PRENATAL DEVELOPMENT OF TOOTH STRUCTURE

Let us begin at the beginning, or better still, with the pregnant woman. The nutrition of the embryo and fetus is derived from the blood stream of the mother, by way of the placental circulation. The developing child can, therefore, draw from the supply of the mother for its needs. In the absence of a sufficient intake of calcium, for example, this mineral can be withdrawn from the tissues of the mother to satisfy the fetus' requirements. The one tissue which does not seem to be affected by calcium withdrawal into the circulation is that of the teeth of the mother, and it has never been definitely established that calcium can be withdrawn from the teeth into the general circulation (2, 3). There is an old expression, "A tooth for every child," which is basically untrue. This concept has been explained by calcium withdrawal from the mother's teeth to supply the needs of the fetus during its period of calcification. If this were so, we should find an increase in dental caries in pregnant women with calcium disturbance, which we do not (4). Clinical studies, moreover, have shown that pregnant women do not have a higher rate of dental caries than do comparable non-pregnant women (5–7). When individuals appear to have an increased caries-attack rate during pregnancy, the cause can usually be found to be due to strictly local factors, rather than to the systemic calcium withdrawal from the teeth.

The calcification of the crowns of deciduous teeth begins about four to five months *in utero* and is completed during the first year of post-uterine life. The crowns of the permanent teeth begin calcification during the first year of life and are completed by eight years of age (with the exception of the third molars) (8). The nutrition of the child can, therefore, influence the structure of these vulnerable parts of the teeth during the time of their formation.

In animal experiments, it has been found that vitamin A deficiency can affect the developing tooth structures (9). It is doubtful whether avitaminosis A of the degree and duration required to produce similar dental disturbances in humans could be tolerated by the infant (10). Such severe disturbances would usually produce marked disability or death. Only one authenticated disturbance of the dentition in a human being caused by vitamin A deficiency has been reported (11).

Similarly, ascorbic acid deficiency during gestation can produce changes in the teeth of experimental animals, but such deficiency has not been shown to affect the teeth of human beings (10, 12).

On the other hand, it has been rather clearly demonstrated that a sufficient intake of vitamin D during this stage of tooth development is of value in the formation of sound tooth structure. Furthermore, there is evidence to show that an increased susceptibility to attack by dental caries may occur

[1] Presented at the 45th Annual Health Conference of the New York State Department of Health at Lake Placid, on June 21, 1949.

in teeth which have been formed during a period of vitamin D deficiency (10).

The most important fact to bear in mind regarding the effect of nutrition on the prenatal development of the dental apparatus is that a well balanced diet, meeting the requirements of the pregnant mother, will aid the child in the development of teeth which are as resistant to dental disease as possible, within the limits imposed by heriditary factors, about which we have a great deal to learn. This does not mean that the child's teeth will be impervious to dental disease, but that he will enter life with the best possible dental structures. After birth, a well balanced diet continues to be important since the permanent teeth are being formed at that time.

After about eight years of age when the crowns have been completely calcified, however, it is doubtful whether good nutrition can increase inherent resistance of the teeth to dental disease. Intake of fluoride salts during the developmental period of the teeth, and the topical application of this chemical after tooth eruption have been shown to increase resistance to dental caries (13, 14).

PREWAR STUDY IN NORWAY

I think that some of the findings from a study conducted in Norway between 1936 and 1940 are noteworthy for they tend to show that good prenatal care can affect the resistance of the primary teeth to dental decay (15). In different communities, careful supervision of the health and diets of pregnant women as well as their offspring was maintained. The deciduous teeth of these children were examined, and the results were compared with examinations of children who came to the health centers after one year of age, that is, after the primary mineralization period of the teeth. These examinations showed that there was a statistically significant difference between the percentages of caries-affected teeth and tooth surfaces of the children supervised before one year and those supervised only after one year. Less dental caries was present in the first group than in the second, and this difference was maintained right through until six years of age. In observing the six-to-seven-year-old group, which was the highest age studied, the difference in dental caries was no longer statistically significant.

This study from Norway tends to show that careful nutritional supervision of the mother during pregnancy will enable the child to enter the world with teeth which are resistant to dental decay. This resistance, however, is only relative, since other factors can overcome this inherent resistance and thereby practically negate our efforts with the pregnant mother.

What are these "other" factors which tend to produce dental caries in spite of all the efforts to develop teeth which are structurally as resistant to disease as nutritional supervision can make them? It is here that we can discuss dental caries, a disease which affects about 97 per cent of our American people.

ROLE OF CARBOHYDRATE IN CARIES

It has been demonstrated and generally accepted by most authorities that dental caries is the result of a series of local, short-term decalcifications of tooth structures by acids. These acids are derived from carbohydrate substances after they have been acted upon by microbial enzymes. These local decalcifications apparently take place almost immediately after eating (10).

If this concept of the mechanism of dental caries is true, then restriction of these refined, fermentable carbohydrates should result in a reduction in dental caries. This has been demonstrated many times (16–19). One of the organisms associated with dental caries (whether as a cause or effect will not be discussed here) is the *Lactobacillus acidophilus*. The numbers of this organism can be reduced by restricting the intake of refined carbohydrate. To quote the results of only one clinical study, we find that reduction in dental caries from ten or more cavities per year to one or more cavities during a one-year period of carbohydrate restriction occurred in 88.4 per cent of a group of 665 cooperative patients (20).

While results such as these, and many others, seem to indict refined carbohydrates as an important dietary factor in the production of dental caries, there have been many interpretations of these studies, and it is here that a great deal of confusion has arisen.

REFINED SUGARS

Probably the main point of contention has been that a completely balanced diet will be a caries-preventive diet, and that such restriction of refined carbohydrate food will constitute a balanced diet, which in turn will inhibit the formation of dental caries. Here we may well be arguing about words. If, by a "balanced diet," we mean complete restriction of refined carbohydrates, then it will be caries inhibitory. If, by a "balanced diet" is meant "eat all you need, and then eat all you want," we will find the average person tending to eat the foods he likes most—usually refined carbohydrates, such as candy, soft drinks, pastries, and other foods made with refined flour. This tendency of the American people to consume huge amounts of sugars can be seen when we realize that the annual consumption of sugar has increased from 10 lb. per person in 1821 to 108 lb. per person in 1931 up to 140 lb. per person in 1945 (21). When these facts are considered, it can be seen that the exact definition of a balanced diet is important before one argues whether it is the exclusion of refined carbohydrates or the inclusion of proteins, fats, vitamins, and minerals which inhibits caries.

Repeated observations have been made to show that lower intake of carbohydrates rather than the higher intake of other foods protects the teeth against caries (22). The evidence from poor nutrition areas in Europe (23), India (24), and our own South (25) has shown that people on sub-optimal diets, even manifesting clinical symptoms of nutritional deficiencies, have less decay than many well nourished Americans. All of these studies have led me to agree with those people who feel it is the refined carbohydrate in the diet which produces caries, rather than the omission of other nutritional elements, once the teeth have been fully formed.

The intake of refined sugars is particularly injurious to the teeth when taken between meals. We now believe that dental caries activity is greatest immediately after eating. Between-meal eating of carbohydrate food—candy, cookies, ices, soft drinks, and so on—exposes the teeth to additional periods of attack. When these caries-producing foods are eaten at meal time, they are more rapidly cleared from the mouth. When eaten between meals as well, many more opportunities exist for caries attack, and the clearance action of other foods is not present (26). In order to consume 140 lb. sugar per person during the year, a great deal of sugar must be eaten between meals—the most dangerous time as far as caries is concerned.

Not only is sugar deleterious *per se*, but it tends to displace more essential foods from the diet. More thiamine is necessary to metabolize sugar, and since high-sugar intake tends to kill the appetite for other foods, we may readily find deficiencies of important food elements resulting therefrom. Massler (21) has gone so far as to compare the appetite for sugar in the child to alcohol craving in the adult. While the consequences as we know them may not be so dire, the parallel is there nevertheless.

I have thus far spoken of the importance of the balanced diet, i.e., the inclusion of all the essential foods, while the teeth are being formed. I then pointed out that excess sugar was much *worse* than omission of proteins, vitamins, and minerals, insofar as the production of dental caries is concerned. But make no mistake, I do not advocate the abandonment of the balanced diet—I merely add to the balanced diet the concept of the elimination of refined carbohydrates.

IMPORTANCE OF A BALANCED DIET TO THE TOTAL ORAL CAVITY

A poor nutritional intake with the elimination of refined carbohydrates may not produce dental caries, but it is an important factor in the production of disease of the tooth-supporting structures. In fact, the mouth and contiguous areas are often the first places where nutritional deficiencies can be seen (27). In this respect, we must consider the mouth as that part of the gastrointestinal system which is most subject to trauma from bacteria, from forces of occlusion, from tartar, and from all the tissue insults which can occur to an organ which is subject to the abuse that the oral cavity is.

Both experimentally and clinically, observers have noted the changes in the mucous membranes of the tongue, gingivae, and lips which can occur from deficiencies in vitamin A, ascorbic acid, niacin, riboflavin, and iron, just to mention a few. But again, confusion has arisen, since most of the changes seen clinically are not due to a single nutritional deficiency, or even to a combined nutritional deficiency alone. Local factors, such as cleanliness of the mouth, poor dental restoration, improper functional occlusal forces, smoking, and so on, may act in conjunction with systemic influences, such as nutritional inadequacy, endocrine dysfunction, blood dyscrasias, even psychosomatic influences and allergic phenomena, to produce many of the clinical pictures seen (28). The symptoms of acute ulcerative necrotizing gingivitis (Vincent's infection, trench mouth) appear to be based upon the destruction of gingival tissue by secondary invading microorganisms, when the tissue resistance has been lowered sufficiently by local factors, superimposed on chronic nutritional inadequacy (29).

It is not only a lowered intake of nutritional elements which may produce a deficiency state, for in some cases the individual may eat a perfectly balanced diet, but the food elements may not be absorbed properly, may be insufficiently utilized, or may be excreted too rapidly. These constitute some of the conditioning factors, first pointed out by Jolliffe (30), which can lead to states of nutritional inadequacy.

PERIODONTAL DISEASES

Diseases of the supporting structures of the teeth account for the greatest number of teeth lost after the age of thirty-five (31). These periodontal diseases, commonly known by the name applied to later symptoms of suppuration associated with destruction of the alveolar bone, "pyorrhea alveolaris," are therefore of great importance as a hazard to the health of the American people. In many areas of the world where poor nutrition exists, we have seen that the rate of dental caries attack has been reduced, but we have also found that the prevalence of gingival and periodontal disease is very high (32). What good are sound teeth when the tissues which hold them in the jaws are diseased and degenerating?

Because of the multiple etiology of periodontal diseases and the long chronic course taken by most types of these conditions, treatment concepts have often been confused. At one time it was believed that the symptom complex of "pyorrhea" was due to an amebic organism, and treatment consisted of injections of amebicides, such as emetine. As other supposed etiologic factors were uncovered, the latest

vogue in treatment consisted in the eradication of these new factors. Today, the most scientific approach to treatment of this group of diseases is first to ascertain the various etiologic factors in each case.

If, from clinical examination and the dietary history and a week's sample menu, it is felt that nutritional inadequacy is a factor, efforts should be made to correct this. Re-establishment of a balanced diet is extremely important. Where long-standing chronic nutritional deficiencies are present, it is often necessary to supplement the diet with concentrated chemical preparations. In general, multivitamin preparations are used, since the deficiencies are usually multiple in nature, rather than due to one nutritional factor. In those cases where conditioning factors are present, active cooperation between the dentist and the physician is necessary to restore the patient to the proper nutritional status. Probably the most important point to remember is that nutritional inadequacy is only one of many factors in the production of periodontal diseases, and that treatment by nutritional procedures alone is usually completely inadequate. In addition, it must be remembered that if nutritional inadequacy is an etiologic factor, it may take prolonged therapy and dietary correction to resolve these factors.

MASTICATORY FUNCTIONS

In this presentation we must not lose sight of the effect that dental and oral disease has on the nutrition of the whole individual, as well as the effect that nutrition has on the dental and oral structures. From the time the child first starts to chew his food, the consistency of the diet is important. Many children are loath to start chewing unstrained food and must be coaxed to start using their teeth and jaws properly. Painful teeth resulting from uncorrected dental caries and later loose teeth and spongy, bleeding gums often cause people to avoid the foods which require vigorous mastication. Not only do these coarser foods supply the functional stimulation necessary to normal growth and development of the masticatory apparatus, but these foods are usually important sources of proteins, vitamins, and minerals, as well as an important factor in regular, normal peristalsis and bowel movement.

When people tend to avoid these foods which require definite chewing, they often develop a diet predominating in refined carbohydrates and perhaps fats as well. This is particularly true of the edentulous or nearly edentulous person. Fortunately prosthetic dentistry in this country is capable of restoring masticatory function to those persons who have lost their teeth. It must be remembered, however, that at best dentures are a poor substitute for a well functioning natural dentition, and further, not all edentulous people are capable of wearing well functioning full dentures.

Many studies of the nutrition in older adults have pointed out the importance of a poor masticating apparatus as an etiologic factor in malnutrition (33). Such people tend to eat those foods which are easily managed, but which do not supply their functional needs. This has led some authors to state that concentrated supplements should be administered to older people to prevent or alleviate nutritional inadequacy (33). It seems to me that this may be the most expedient way to treat existing poor nutrition in the aged, but the most fruitful approach would be to establish good nutrition and dietary habits in the young and then maintain these throughout life.

NEED FOR BALANCED DIET IN DENTAL HEALTH

From all of the foregoing, we can conclude that a well balanced diet, in the true meaning of the expression, is just as important for the health of the teeth and other oral tissues as it is for the health of the rest of the body. Since these structures present highly specialized tissues which are subject not only to intimate contact with food but to many varied destructive influences, they appear to be more sensitive to deviations in dietary practices from a well balanced diet.

Since the oral cavity and its contents can be viewed quite readily, and since a whole profession with its subdivisions is devoted to the care of these structures, a great deal can be done to benefit the general health of the individual. It is true that our knowledge of the effects of nutrition on oral health is by no means complete, but by diligent application of our existing knowledge and the correct use of scientific information which research presents to us, we can continue to apply our skills for the maintenance of health and the eradication of disease.

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Projects of Dietetic Interns

Each year, many dietetic interns are given projects which prove of real value, not only to the development and maturation of the intern herself, but to the organization with which she was working. This year, the projects of two dietetic interns at Aetna Life Affiliated Companies, Hartford, Connecticut, which have been reported to the JOURNAL, seem to have special merit.

The first concerned curriculum planning for the interns themselves. Nancy Boggs, a graduate of Florida State College, following the outline of Taba *et al.* in the June 1950 issue of the JOURNAL, worked out a unit on standardizing and pricing recipes for use in teaching dietetic interns. In it, she broke down the steps used in standardizing and pricing recipes and analyzed the needs and objectives in teaching such subject matter. Then this information was reorganized and presented as a combined outline of content and learning activities, comparable to that which appeared in the JOURNAL.

The second project concerned cafeteria service in a hospital. Ruth Thompson, a graduate of Simmons College, was assigned during her internship at Aetna for a period at a neighboring hospital. In this hospital the cafeteria for personnel had recently been put on a pay-as-you-go basis, and personnel were paid stipends for food. At the same time, a sudden rise in costs had caused cafeteria prices to increase to the point where it was impossible for employees to eat for the stipend they received. This rise in prices, plus dissatisfaction with the quality of food, had caused cafeteria business to decrease. Miss Thompson's problem was to study the cafeteria operation from an outsider's viewpoint and to make suggestions regarding menu selection, methods of preparation and service, merchandising, and any other related factor.

After interviews with the director of dietetics, the cafeteria supervisor, and various cafeteria employees, as well as observation of the cafeteria operation, Miss Thompson made suggestions which resulted in improvements in salad and sandwich service, faster service for customers, improved quality of food served due to more frequent preparation in smaller quantities, and menu additions at the request of customers. Employees were also shown methods which made their work easier and faster. Following this study, both the director of dietetics and the hospital administrator reported improved customer attitudes and that Miss Thompson's work had proved to be a stimulant to the cafeteria employees.

The Sprue Syndrome—Improved Dietary Management[1]

DAVID ADLERSBERG and DORIS RABINOWITZ

Nutrition Clinic of the Medical Services and Dietary Department, Mount Sinai Hospital, New York City

SPRUE is considered to be a syndrome and not a disease. The impaired intestinal absorption of fat, fat-soluble vitamins, some carbohydrates, especially polysaccharides, as well as other essential nutritional factors, is the central point of this disorder in association with various manifestations of nutritional deficiency.

THE SPRUE SYNDROME

The chief symptoms of sprue are diarrhea and steatorrhea—bulky, tan-colored stools containing large amounts of undigested fat. In association with steatorrhea there develops loss of weight which may be very considerable; there is a peculiar form of anemia, usually macrocytic in character, which resembles that of the Addisonian type, and there are characteristic lesions of the mouth and tongue. A painful sore red mouth and the history of diarrhea should always remind one of sprue as a diagnostic possibility. The oral lesions may interfere with the proper alimentation and thus enhance nutritional deficiency.

There are other associated abnormalities which are important from the diagnostic viewpoint but are secondary to the disturbed function of the intestine and to the defective absorption (1, 2). In severe cases of sprue, diminished concentration of calcium in the blood in association with tetany may be observed, because large amounts of dietary calcium are lost in the alimentary tract in combination with fatty acids. Severe hemorrhage may develop as a result of malabsorption of vitamin K and hypoprothrombinemia. In some instances peculiar pigmentation of the skin may be found, and because of this pigmentation, severe cases of sprue may even resemble Addison's disease. The possibility that sprue may be related to pathologic changes in the adrenals was seriously discussed (3), but our own studies were negative in this respect (2). Severe hypoproteinemia may develop in sprue with all the associated signs of edema, ascites, and hydrothorax.

During the active stage, almost all patients with sprue exhibit polyvalent vitamin deficiencies. The lesions of tongue and mouth are evidence of deficiency of factors of the B-complex probably in combination with protein deficiency, but evidence of deficiency of vitamins A, D, E, and K as well as of ascorbic acid may be present in various combinations. Thus sprue may be associated with scurvy, osteoporosis, hypoprothrombinemia, and pellagra-like symptoms. There may be evidence of hepatic damage, and cases of sprue were observed with icterus, laboratory evidence of hepatic impairment, and characteristic post-mortem changes of the liver (2).

Diagnosis

The classification of tropical and non-tropical sprue, idiopathic steatorrhea, and celiac disease may be maintained for clinical purposes. The consensus favors the view that these conditions are varieties of the same disorder, the sprue syndrome.

In a previous publication the diagnostic criteria and the differentiation of "primary" and "secondary" sprue were elaborated (2). A flat glucose tolerance test and a flat vitamin A tolerance test are of great diagnostic significance, especially in atypical or milder cases. There are rare instances of sprue without diarrhea in which formed, tan-colored stools contain large amounts of undigested fat. The mild and atypical cases may escape diagnosis for many years. We must stress the fact that typical cases of sprue were observed in the population of our large hospitals and in patients who had never left the temperate zones. Sprue of the non-tropical variety is with us, and with the increasing knowledge, it is being diagnosed with increasing frequency.

Etiology

The basic etiology of sprue is unknown although a number of theories have been proposed. A detailed discussion of the considerations involved will be found in Manson-Bahr's monograph on *The Dysenteric Disorders* (4), and in reviews by Castle *et al.* (5), Stannus (6), and Stefanini (7).

[1] Received for publication January 26, 1950.

At present, the concept prevails that sprue is a deficiency syndrome, i.e. a nutritional disorder, the central point of which is the disturbed intestinal absorption. Experiences of the past few years, and especially observations on tropical sprue during and after World War II, gave ample support to this concept. In most patients, there is a history and objective evidence of prolonged dietary inadequacy. The deficiency of animal protein has been particularly emphasized. Observations in Puerto Rico (8), in Burma (3, 9), in Egypt (10), and India (11–13), demonstrated a higher incidence of sprue among vegetarians than in persons eating meat. Stefanini (7) confirmed the importance of the dietary factor in his recently published observations on tropical sprue among Italian prisoners-of-war stationed in India. British soldiers who received a diet high in animal protein (daily average 96.2 gm.) had an incidence of sprue of 6 per 1000 while in the same year and in the same area of India, Italian prisoners-of-war whose daily ration of animal protein was considerably lower (26.1 to 28.8 gm.) had an incidence of 24.15 per 1000. The Italian prisoners-of-war had also a much lower intake of vegetable protein than the Indian troops (57.25 versus 81.25 gm.), and this difference might also have contributed to the higher incidence of sprue among the former. In addition, the diets were lower in fat, unpalatable, and monotonous, and all these factors resulted in a dietary inadequacy which was proportional to the incidence of sprue.

Sprue-like conditions in association with nutritional deficiency, were observed among the prisoners-of-war in the Far East (14, 15) and in inmates of various concentration camps under the Nazi regime: Auschwitz (16), Belsen (17–19), Lansdorf (20), and in Holland (21). There is also evidence that clinical conditions described as parasprue (22), hill diarrhea (23), pale diarrhea with macrocytic anemia (7), and anemia with dyspepsia (11–13) were, in reality, sprue in various stages, and with various clinical manifestations. "The differentiation of these syndromes from sprue is often artificial and confusing" (7).

The therapeutic efficacy of a high-protein diet and the specific response to liver extract, vitamin B_{12}, and folic acid are compatible with the concept of deficiency of some dietary factors, the exact nature of which is unknown. Aside from the dietary factors, there may be still other etiologic factors involved. Even extremely critical observers emphasize the endemo-epidemic incidence and the seasonal occurrence of tropical sprue in certain areas (9, 14, 24). The length and severity of the rainy season seems to be an important factor, and previous intestinal infections and infectious diseases as a whole (malaria) are apparently predisposing and exacerbating factors but certainly not the direct cause of the disorder (7).

In the opinion of most students of sprue, dietary deficiency obviously plays the most important role in the genesis of sprue, but diet alone cannot explain all the peculiarities of the incidence of the syndrome. The nature of these local and seasonal factors is even more obscure than that of the dietary factors.

Therapy

The treatment of sprue is essentially empirical. The dietary therapy in sprue consists of a low-fat, high-protein diet with only moderate amounts of carbohydrates, preferably given as monosaccharides. Bananas and strawberries, lean scraped beef, ground or minced chicken, egg whites, and cottage cheese are a good start. The amount of food is gradually increased in proportion to the patient's tolerance. High-protein skim milk and powdered skim milk may be tried, and small amounts of bread and other starches may be slowly added.

Liver extract, preferably in crude form, vitamin B_{12} or folic acid, as well as other vitamin concentrates are given from the beginning. Although some patients are cured by one course of specific therapy for the rest of their lives, the majority do not respond so satisfactorily and must be maintained on diet and usually liver extract for many months and years. This is true for tropical (9) as well as non-tropical sprue (2). An attempt to stop specific medication may lead, in a similar way as in pernicious anemia, to a complete relapse in a few weeks or months. In contrast to patients with pernicious anemia, patients inflicted with sprue are compelled to adhere to the "sprue diet" for long periods of time, since transgressions of the diet, i. e., consumption of larger amounts of fat and/or starches, even during full remission, may lead to abdominal discomfort and diarrhea. The use of emulsifying and wetting agents, like lecithin, Tween 80 (Sorlate), to improve absorption of fat and fat-soluble vitamins (5, 10, 21, 25–29), is only of moderate practical value and does not dispense with the limitation of fat and starches as the characteristic feature of the sprue diet. Strict limitation of carbohydrates to only those found in fruits and to a lesser extent in vegetables has been emphasized by pediatricians for the treatment of celiac disease. Adherence to this principle results in improved tolerance for fats (30, 31).

DIET THERAPY IN SPRUE

A frequent complaint of the sprue patient is the monotony of the diet therapy. It actually requires stamina to eliminate fats and starches to the extent where one eats only lean meat or cheese and fruit and drinks skim milk for breakfast, lunch, and dinner for many months or years. These complaints of our patients resulted in continued experiments and trials in the Dietary Department of the hospital to improve the sprue diet and to offer more variety in the menus. A variety of low-fat, high-protein dishes were prepared which fulfill the criteria of the sprue diet and yet permit more normal appearing meals consisting of appetizer, soup, entrée, and dessert.

Appetizers[2]

Appetizers may be used in the sprue diet as a means of adding protein and at the same time in helping to stimulate the patient's appetite. For example, a tomato nog may be made by adding about 2 Tbsp. cottage cheese to a glass of tomato juice and beating till the mixture is smooth. This beverage alone contains about 8 gm. protein, 10 gm. carbohydrate, and only 1 gm. fat.[3] Another appetizer may be made by adding to chopped liver a little tomato juice and egg white instead of the usual fats. One Tbsp. of this "chopped liver" gives 4 gm. protein and only 2 gm. carbohydrate and fat. Cottage cheese, banana, and Melba toast crumbs may be combined to prepare various appetizing dishes.

Soups

Soups were found to be an easy vehicle for increasing the protein content of the diet without adding too much fat or bulk. Meat, fish, and sea food may be used. It is important, however, that soups be mildly flavored. About 5 gm. protein can be supplied by adding to bouillon either an egg white or 1 oz. grated Parmesan cheese, ground beef, or liver. Also, sea food chowders can be made with about ½ cup skim milk and 2 oz. either oysters, clams, or mussels and their liquor, or fish, thus supplying 10 or 11 gm. protein and about the same amount of carbohydrate. Low-carbohydrate vegetables may be used in soups with either fish, sea food, or meat.

Entrées

Lean meat, poultry, or fish should be used at least once a day. It is important when choosing meats and fish to avoid those with a high fat content such as pork and fat fish like eel and canned tuna. Other meats should always be trimmed to keep the fat as low as possible. Meat, fish, and poultry should be broiled, boiled, or roasted.

To avoid monotony, other main dishes were planned with cottage cheese, ground meat, fish, and sea food. By combining cottage cheese with meat and fish, the protein can be increased without substantially increasing the fat in the diet. For example, if 2 oz. cottage cheese are added to ¼ lb. ground meat with a little tomato purée, egg white, and Melba toast crumbs to hold the mixture together, and baked for half an hour in a moderately hot oven, a meat loaf is made which yields about 50 gm. protein and only about 8 or 9 gm. carbohydrate and fat. Banana or banana flakes can also be added to ground beef and used in a meat loaf, either with or without cottage cheese and makes a rather appetizing combination. A variety of Newburg sauce can be made by straining 4 Tbsp. cottage cheese and combining with about 2 Tbsp. skim milk. This sauce can be poured over fish or sea food and baked with a few crumbs on top, resulting in a delicious dish which doubles the amount of protein

Vegetables and Salads

Only low-carbohydrate vegetables can be used on the sprue diet, and even those are limited to the more bland. Some raw vegetables, such as lettuce, tomatoes, endive, and other greens, may be served and even small quantities of radishes and cucumber. Of the cooked vegetables, asparagus, stewed tomatoes, broccoli, cauliflower, spinach, Swiss chard, summer squash, and string beans may be used. Here again, protein can be added in the form of specially prepared sauces and salad dressings, grated cheese or grated hard boiled egg white. Some frozen and molded salads can also be prepared with cottage cheese and gelatin. The same cheese sauce used for the sea food can be used on vegetables, such as broccoli and asparagus, and will yield about 15 gm. protein, 10 gm. carbohydrate, and only 1 gm. fat. The sauce is poured over the vegetable and heated in the oven a few minutes and served as a vegetable au gratin. It can also be combined with a strained vegetable and baked in the oven to make a kind of vegetable cheese pudding.

Desserts and Beverages

In desserts as well as in other foods, attempts have been made to add protein by combining the allowed fruits (preferably bananas and strawberries) with cottage cheese and gelatin wherever possible. By combining a beaten egg white with ½ cup mashed bananas or strawberries and a little lemon juice, a delicious banana or strawberry whip is made which supplies approximately 3 gm protein and no extra carbohydrate except that of the fruit. By using any unsweetened gelatin dessert with banana or strawberries, 3 gm. protein may be added to the diet. It is also possible to combine these fruits with skim milk and gelatin to make creamy type puddings which supply about 5 gm. protein. By combining ½ cup mashed bananas with the same amount of cottage cheese and folding in a stiffly beaten egg white, a pudding is made which contains about 11 gm. protein and 14 gm. carbohydrate. Banana flakes can also be used successfully to make palatable puddings. A banana Betty can be prepared by adding Melba toast crumbs to a sliced banana and baking in the oven for a few minutes. Another way of adding protein to bananas is to mash the banana and beat with about 2 Tbsp. skim milk. When chilled, this makes a tasty dessert and yields about 3 gm. protein.

Combinations of skim milk, bananas, cheese, and powdered skim milk can be used to add protein to

[2] Reprints of this paper including an appendix giving recipes for twenty-two dishes used in sprue diets, will be available from the authors shortly after publication.

[3] The carbohydrate, protein, and fat figures used in this paper were computed from the tables of Bowes and Church (26).

the diet in liquid form. These drinks can be used for extra feedings or with meals. By combining 2 Tbsp. cottage cheese with a glass of skim milk, a cheese nog results which contains 12 or 13 gm. protein and carbohydrate. A skim milk nog can be made by combining ¾ glass skim milk with 4 Tbsp. powdered skim milk, and it can be flavored with saccharin and vanilla or else with banana (mashed). One glass of this drink supplies about 20 gm. protein. The carbohydrate, however, is high—about 25 gm. in the plain milk nog and almost 50 gm. in the banana milk nog. Banana flakes can be combined with skim milk also to make a kind of banana flake milk shake. The proportions would be about 1 Tbsp. banana flakes to ¾ cup skim milk, yielding about 6 gm. protein.

Spreads and Salad Dressings

Since butter should be limited in the sprue diet, various spreads were prepared as substitutes. Their use also helps to achieve a higher-protein intake. A tablespoon of cottage cheese can be thinned out with a teaspoon of skim milk and makes a very adequate spread containing about 6 gm. protein. For a different flavoring, 1 Tbsp. tomato juice can be added.

A cheese salad dressing can be made with 1 Tbsp. of both cottage cheese and skim milk and a little lemon juice and paprika added. It is a tasty dressing and supplies about 4 gm. protein.

SUMMARY

Sprue of the non-tropical variety is not infrequently encountered in patients who have lived exclusively in temperate zones.

The majority of patients with sprue require specific therapy over long periods of time. This includes specific medication, such as liver extract, vitamin B_{12} or folic acid, and a specific diet which is high in protein, low in fat, and contains only moderate amounts of carbohydrates, preferably as monosaccharides. The monotony and low palatability of the customary sprue diet represents a great difficulty in the successful management of sprue patients.

Suggestions are offered for improved diets in sprue which are well tolerated and offer palatability and variety and approximately "normal" menus.

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Dietary Consultation—A Service for Small Institutions

III. Food Preparation, Storage, and Waste

Compiled by Grace McMahon[1] for the National Committee of the Community Nutrition Section[2] of the American Dietetic Association on Preparation of a Manual for Use in Dietary Consultation Service to Institutions without Trained Food Service Personnel

CONSULTING dietitians have found that institutional personnel need and frequently request assistance in improving methods of food preparation and storage and in reducing waste. On the other hand, in many cases, the consultant must first provide an appreciation and desire for the service of a dietetic specialist. Even in those cases where she receives the complete support of the institution's administration, the evaluation and improvement in food preparation and service is one of the most difficult tasks she must face in her work. The consultant will need to solve the problems of: (a) improving the food standards in terms of palatability as well as nutritional content; (b) bettering the methods used to reach improved food standards; and (c) providing more attractive methods of service.

The purpose of this paper is to recognize and consider these areas of responsibility of the consulting dietitian and to provide a critical bibliography consisting of two types of source materials: first, selected references to new and pertinent material which will help the consultant in meeting her own problems, and second, references to material for lay persons which can be distributed by her directly to the personnel in institutions.

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FOOD PREPARATION

The consulting dietitian in assuming her position accepts the responsibility of keeping up to date concerning new methods of quantity cookery which preserve the maximum nutritional qualities of food, as well as a high degree of palatability. There are many older reports as well as recent studies on food preparation, both of a general and a specific nature (1–15) which will help her in this phase of her work. Compilations, abstracts, and reviews (16) also provide this type of information which she can translate into language and methods understandable to the untrained employees who are actually doing the food preparation in the institutions.

In improving the methods of food preparation, the consultant will have many factors to consider, each one varying with the institution concerned. She will always find that local and regional food habits exert a major influence on food preparation methods and standards, as well as on food selection. She also will discover that there is a wide range of standards of quality within any one area. It follows, therefore, that the consulting dietitian should first know the local situation thoroughly *before* she begins to make recommendations, for any information she will offer on scientific methods of cookery must be judiciously adapted to the local customs. In this respect, she will realize that change in local food patterns is not always desirable, unless they are directly responsible for causing important nutritional deficits, and only after a complete study of the menu, methods of food preparation, and actual consumption can the sufficiency of the diet be determined.

IMPROVING FOOD STANDARDS

Even when changes seem advisable, they cannot always be brought about overnight. People prefer familiar food—food which they customarily eat at

home—and the reduction of nutritional loss due to cooking methods may require a long-time program of education before the personnel accept the new methods and the patients accept the products cooked in the new way.

In working with personnel, the consultant may discover that the cooks have never seen or eaten what she would consider high quality food. Thus, their appreciation of improved standards may need to be developed. She might suggest, if possible, that they visit places to eat in the vicinity where food of high quality is served. Pictures and posters from magazines and advertisements may also be used to arouse interest. Institutes might be planned with preparation of good food an important feature of the program.

IMPROVING METHODS

Perhaps the most frequent violations of the principles of good cookery are the use of too long a cooking time for vegetables and the use of too high a temperature for too long a time in meat cookery. To help correct these practices, the use of simple, short, and easy-to-read teaching aids will prove effective. The posters published by the U. S. Department of Agriculture (17) have been outstanding in their presentation of the rules for cooking vegetables, including a time table for quantity cooking, and of methods of salad preparation. Meat cookery is explained well in publications by home economists of the meat industry and in other printed materials (18–19). In presenting the principles of meat cookery, its importance as an economy measure is usually stressed as well as the nutritional advantages of proper temperatures and cooking times.

The role that salads play in the overall acceptability of the institutional dietary cannot be underestimated, and attention to salad production pays for itself immediately in the improved appearance of meals. This does not mean that elaborate arrangements are in order; rather, it emphasizes the need for meticulous preparation of the vegetables or fruits used for salads. The limitations of personnel, money, and time can, of course, be the cause of poor salads, but other reasons may be the lack of proper methods of preparation, lack of knowledge as to what an attractive salad should look like, and complete indifference to the value of salads in the diet. The truth of this last reason can be verified by a tour through our rural areas where there is an evident lack of appreciation of fresh fruits and vegetables. They may be used plentifully in season—tomatoes, for example—but there are many months when raw fruits and vegetables are not considered a part of the diet. Thus, the consultant may need to encourage the use of the vegetables which are available.

Information on standards of preparation of frozen foods, now a part of almost every institutional kitchen, has been developed by the processors and distributors. There has been other research on various pre-cooked and prepared frozen foods (20–24). Since many institutions use meats which are stored in local food lockers, additional references concerning the processing of frozen foods in community lockers may be valuable (25, 26). The use of pre-cut and frozen meats may prove to be practical for institutions without the services of a butcher (27).

The many recipes available for baked goods, puddings, and desserts attest to their popularity. In this area, the consultant may need to answer questions concerning quantity mixing methods and the use of mechanical mixers. Short cuts in the preparation of these items is now possible. Commercial pre-mixes are available, and the pre-preparation of food (28) offers new time-saving devices.

Assistance with methods of canning and processing may be needed also in some of the smaller institutions. Excellent pamphlets on this topic have been prepared by the U. S. Department of Agriculture (29–31).

There may be a need to emphasize the necessity of preparing food as near to the serving time as possible, but to accomplish this, a study of layout, equipment, personnel, and type of service may be necessary. A change of attitude among the employees may be in order, too, for such a schedule of preparation may be quite contrary to the habits of cooks who believe "quantity" cookery should be just that and who like to finish their work early.

The cooks may also need instruction in the use of recipes. How well dietitians know the importance in following a recipe of having the employee read it first! Terms, while usually simple, may need to be explained, and a reference to the definition of some of these terms might also help (2). The use of tables giving appropriate substitutes and conversion tables (5) can also be suggested. Other source materials useful to cooks include a chart of capacities of unmarked utensils or equipment (to be determined and recorded by local personnel), data on the capacities of the standard scoops (32), and portion sizes and amounts to serve a given number, such as fifty (5). Such information, if easily accessible to the cooks, can serve as a valuable method of control of quality—a task that may be extremely difficult when there is no direct supervision and the consultant must work by remote control.

Standardizing Procedures

If the basic, scientific principles of cookery are presented and accepted, the use of an accurate, standardized recipe will follow logically, since it is the foundation of reliable and reproducible methods of food production. In this most time-consuming step in achieving quality food production—the development of the standardized recipe—much more is entailed than simply preparing a recipe and decid-

TABLE 1
Sample form for a recipe card

NAME OF PRODUCT IN LARGE LETTERS	XYZ INSTITUTION Standardization completed *(insert date)*			
Ingredients	25 portions		50 portions	
	Weight	Measure	Weight	Measure
(In large, clear print, list ingredients in order of use and with a minimum of abbreviations)				
Method: 1. 2. 3. Time and temperature: Portion size: Size and type of utensil or pan:				

ing that it is a good product. An example of the detail required in standardization might be outlined briefly by the consultant as follows:

(a) Choose a favorite recipe, perhaps in a family size, and decide whether it would be practical for preparation in the institution. Ask the following questions about it: Does it contain too expensive ingredients? Does it require too much time to prepare? Is it popular enough to warrant spending time in working with it? Is the equipment needed to prepare it available? The problem may actually be one of producing good food with out-of-date equipment. For example, a few coal ranges are still in use, and since the time for top-of-the-stove cooking varies, techniques for these particular situations may need to be developed. However, with steam equipment now available at reasonable prices, the consultant may be successful in advising the purchase of this type of equipment for use as an efficient auxiliary method of cooking along with the coal range.

(b) Prepare the recipe according to instructions. Score the resulting product for yield and characteristics of flavor, texture, color, and other pertinent factors. Obtain scores from other persons. If changes are indicated, vary only one ingredient at a time, noting yield and quality each time a variable has been introduced. When a completely acceptable product has been made on a small scale, the recipe can then be enlarged.

(c) Enlarge the recipe to the size which will provide the number of servings usually required in the institution. This should be done gradually, first doubling the recipe, then subsequently increasing it until the amount desired is produced. Each time the total quantity is increased, the product should be scored again. Variations in methods should also be tried, to be certain the best procedure is being used. Here again, only one change should be made at a time and results of each variation recorded and evaluated.

(d) Record the recipe. In writing recipes, the information should be easy to read, easy to follow, and clear in every detail. The following should be included: complete description of ingredients in the proper weights and/or measures with a minimum of abbreviation (the advisability of using weighed rather than measured quantities should be stressed); description of each step or procedure in chronological order; indication of the size of utensils to be used; yield of a definite size portion; and complete cooking instructions, including time and temperature. The actual form and size of the recipe card would depend on the needs of the institution, but a form such as that shown in Table 1 might be adaptable. To prevent recipes from being lost, duplicate files for use of the cooks and management are recommended.

Such sources of standardized recipes as the Sullivan File (33), Fowler and West (5), and others

(34–45) will provide an initial help in building an adequate file of recipes.

FOOD SERVICE

After the food has been properly prepared, the problem may be that of serving it attractively. The consultant at all times should stress simple food, well prepared and simply but attractively served. The importance of this may not be realized by persons who have previously cooked only in small quantities and have not had to merchandise their cooked products.

Casual observation will usually indicate where instruction and improvement are needed. For instance, the habit of ladling an entrée of soupy consistency onto a flat plate is unattractive to most people. This can be avoided and remedied by the use of flat bake pans and casserole-type dishes, although this change usually requires some educational work on the part of the consultant and an expenditure for new small equipment.

Carving is perhaps the most important phase of meat service, and to do it properly, the right tools and correct procedure are essential (1). To serve vegetables neatly in whole pieces may require not only a change in cooking methods, but a change in the type of serving pans. The neat service of dessert and the proper fill of cups and glasses to prevent spilling are niceties of service that should be included in serving instructions. A new book by Livingstone (46) describing and picturing attractive service has recently been published.

STORAGE

The space requirements for adequate dry storage and refrigeration vary with the menu and the purchasing procedures of the institution. The consulting dietitian may find adequate provision for canned and staple goods, perishable and semi-perishable vegetables, dairy and meat products, and frozen foods. If the physical plant is inadequate, however, alterations in layout and/or purchasing may be required to maintain at least the minimum requirements of sanitation and food control. A discussion of storage as it affects sanitation will be included in a later paper in this series (47).

A graphic description of simple but complete storage facilities is included in the government publication on school lunchroom needs (48). More detailed specifications of both storage and refrigeration requirements will be included in an article on equipment which will be published later in this series (49). Other sources provide additional information on storage requirements (50–52), but the following simple rules are examples of the initial points of emphasis.

(a) The importance of a thermometer inside the refrigerator is often stressed.

(b) Store all perishable foods at a temperature of 50°F. or below.

(c) Store raw meats at 40°F. or below.

(d) Store frozen foods at 0° to 10°F. One consultant has prepared a booklet of information on freezers because frozen food storage has become so important.

(e) Store staples and canned goods in a cool, dry room that is well ventilated. Cross-stack staples in cloth or paper bags on racks to provide for circulation of air.

(f) Screen windows; walls and floors should be rodentproof.

(g) Cereals and cereal products purchased in bulk should be stored in metal containers with tightly fitting lids (53).

In small institutions, literature concerning home storage of foods (54) might be helpful, as would educational charts.

WASTE

The control of waste is one of the most important criteria of managerial efficiency, but it is difficult to discuss waste when a department has no supervision or trained personnel to whom this responsibility can be delegated. In fact, this is one of the strongest arguments in favor of having a supervisor for the dietary department.

Because waste as it is defined means to "expend needlessly, carelessly, or without valuable result," it can include waste of material, namely food, supplies, and equipment; waste of time in poorly planning work schedules; and waste of effort in poor personnel administration. The wasting of time and effort will be a part of the discussion on personnel (55). The wasting of material is the crucial point in food cost control.

The points to be emphasized here are those sources of waste in food preparation. Assuming that the food purchased fulfills the specifications, then the preparation of exact amounts exactly as the recipe demands is the beginning of waste control in preparation. This means that pre-preparation of fruits, vegetables, and meats must be done carefully. It also indicates that there should be no unnecessary waste of valuable food nutrients by improper methods of receiving, storage, and food preparation.

Food should be prepared only in amounts necessary for immediate consumption, for left-overs indicate either poor planning or unacceptable food (56). Edible plate waste cannot be eliminated with poor food, and an unnecessary amount is an indication that the problems of feeding the specified group are being inadequately met or that the portions are too large. Some study has been given to this problem (57–60).

The consulting dietitian will find it a challenge to inculcate in the personnel of the institutions she visits an appreciation of good food, thriftily planned and prepared, to the end that better food is produced and served to patients.

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Vitamin B_{12}

Evidence of a direct relationship between vitamin B_{12} and the synthesis of nucleic acids in the body was presented at the 118th national meeting of the American Chemical Society in Chicago in September. Drs. Irwin A. Rose and B. S. Schweigert, Department of Biochemistry, University of Chicago, and the American Meat Institute Foundation, explained that two types of nucleic acids—ribonucleic acids, often designated as RNA, and desoxyribonucleic acids (DNA) are known to be present in all plant and animal cells. RNA are found primarily outside the cell nucleus and are thought to have something to do with protein synthesis, while DNA are found only in the nucleus, and also in large amounts in viruses.

In experiments in their laboratory they reported that the growth rate of rats roughly paralleled the amount of B_{12} in the diet. When B_{12} was included in the rats' diet for two weeks, the amount of DNA in the liver increased by 25 per cent as compared to B_{12}-deficient animals, although no difference was observed in the protein content of the liver.

The RNA changed only 8 per cent in the two weeks, but when rats received the B_{12} supplement for four weeks, the level of RNA in the rats' livers had reached a level 25 per cent above that of the deficient animals. These investigators reported that since the protein level in the liver was the same in both groups of rats and that the number of cells per unit weight of liver was only about 10 per cent greater in the supplemented animals. Therefore, it seems probable that the relatively large changes in the nucleic acids (usually quite constant under other conditions) were due to the specific action of B_{12}.

Another paper given at this same meeting reported that vitamin B_{12} enhances the susceptability of rats to liver cancer produced by the dye known as "butter yellow." Dr. Paul L. Day, Department of Biochemistry, University of Arkansas School of Medicine, pointed out, however, that there is absolutely no evidence that vitamin B_{12} itself causes cancer, for in a control group of rats which received B_{12} without the dye, no sign of tumors was found. It was only among those animals which received the combination of the dye and B_{12}, combined with a methionine-deficient diet, that significantly more tumors developed. Under this regimen, four times as many animals developed liver cancer as among rats which received the cancer-producing dye by itself.

In his investigation Dr. Day used four groups of animals: one received a methionine-deficient diet containing butter yellow. Another received the same diet supplemented with vitamin B_{12}. A third group received the diet without B_{12} but with methionine added. A fourth group was fed the dye-containing diet with both vitamin B_{12} and methionine supplements.

At the end of 170 days, when the rats were sacrificed, the incidence of tumors was 17 per cent in the first group. The highest incidence (78 per cent) was found in the second group.

The experiment seems to indicate that for maximum production of liver tumor in rats, three conditions are important: (a) presence of the cancer-producing dye (butter yellow); (b) deficiency of the essential amino acid methionine; and (c) presence of vitamin B_{12}.

Dr. Day emphasized that "it would be unfortunate if this experiment were interpreted as indicating that vitamin B_{12} itself is carcinogenic. There is no evidence that such is the case. On the contrary, a control group of rats receiving vitamin B_{12} without butter yellow showed no evidence of tumors."

Nutritional Status of Children

XIII. Accuracy of Calculated Intakes of Food Components with Respect to Analytical Values[1]

RUTH UHLER THOMAS, MARJORIE MACY RUTLEDGE, ELIOT F. BEACH, ELSIE Z. MOYER, MARY CATHERINE DRUMMOND, SOL MILLER, ABNER R. ROBINSON, O. NEAL MILLER, MARGARET N. CORYELL, and ICIE G. MACY

Research Laboratory, Children's Fund of Michigan, Detroit

PRECEDING papers in this series (1–11) have presented the results of microchemical determinations of nutrients in the blood and evaluations of group feeding practices as parts of a comprehensive investigation of the nutritional status of children in the care of private agencies and of various methods employed to assess dietary adequacy. In the first paper (1) the possibilities of such studies, with special emphasis upon the role of the dietitian, were outlined. In the second paper (2) was presented a general description of the five groups of subjects, the environments in which they lived, and the procedure used in studying each group. In these papers we have emphasized equally the values and the limitations of the various methods of evaluating nutritional status, stressing that a more reliable estimate of nutritional status is obtained by a combination of several indices of physiologic performance and dietary adequacy.

As a part of the investigation of the nutritional status of children at Holy Family Orphans' Home, Marquette, Michigan, the foods eaten by four children were weighed separately during seven consecutive days in the fall and in the spring (12). Composites representative of the total food intakes of each child were collected for analysis every day of the fall and spring periods of study, and the results provided the most precise values obtainable with which to evaluate the accuracy of the calculations of dietary composition. Standard tables of food values (13–25) were used to calculate intakes of nutrients from the amounts in each food ingested. Values for cooked foods were used when available; in other instances allowances were made for losses in cooking. Recipes for all mixed dishes were used to calculate the percentage composition of the various components.

VARIABLES PORTRAYED IN RESULTS OF ANALYSES

Analyses of samples of the foods actually eaten by individuals is recognized as the most accurate method of determining nutritive intake. However, the analytical values resulting from our basic method of ascertaining food composition include variability attributable to techniques of sampling, preservation, and measuring as well as to errors inherent in the best analytical methods now available. The factors are small, however, in comparison to the sources of variation involved in estimating the amounts of nutrients supplied by foods without results of laboratory determinations upon samples as nearly as possible identical in composition with those ingested.

Many factors may affect the data recorded for the composition of food stuffs. Adams (26) pointed out that "loins of pork decrease in thiamine content from the lumbar to the thoracic end" and emphasized the tremendous differences among animals. The same author even found marked differences in the ascorbic acid contents of apples from the north and south sides of the same tree. Contaminants from equipment, environment, and reagents are ever-present possible sources of error. Analytical procedures accurately executed have small percentage errors but different methods may yield quite divergent results. Kaser *et al.* (27) made thiamine determinations by two different techniques in eight complete meals and obtained mean values of 0.435 and 0.331 mg. Mickelsen *et al.* (28) found that the addition of a detergent (0.5 per cent Duponol) to food collected for fat analysis resulted in more complete extraction of fat by ether.

VARIABLES PORTRAYED IN TABLES OF FOOD COMPOSITION

Tables of values for food composition are compiled from the results of many analyses of food, each result being subject to the sources of error in sampling and the analytic procedure. The "standard" values derived may represent variation from additional sources: imbalance in number of analytical values included with respect to geographic origin, species, maturity, storage before analysis, method of

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processing, and analytic techniques. These variations also are portrayed in the lack of agreement between different compilations of "standard" values for food composition (27, 29, 30).

In calculating intakes of food components from tables of standard values, the variabilities characteristic of the compiled data must be considered in relation to their use. Specific conditions add further hazards to precise evaluation of the nutrients in diets. Only with foods approximating in composition the values used as standards for calculation could close conformance with values from analyses be expected. Under other conditions the various divergent factors should be considered with the data from calculations in evaluating the adequacy of food intakes.

In dietary studies in which menus are not controlled, values for the composition of all foods served under the conditions of preparation are seldom available in a single standard table. Usually a list of standard values must be compiled from several sources to obtain data applicable to all of the foods and combinations served to the group being studied. In surveys of two or more groups, the same list of standard values should be used with the diet of each group, unless actual analyses have shown that different standards more accurately represent the composition of the food eaten. Bransby, Daubney, and King (31) have emphasized the importance of considering systematic deviations from standard values, such as a high content of some mineral in the water supply, consistent use of low-fat milk, and continuous use of meat from which visible fat is trimmed. Seasonings (32) and condiments often contain appreciable amounts of some nutrients which should be recognized in calculations.

Energy values are especially subject to miscalculation and misinterpretation. Determination of the caloric value, or heat of combustion, of material includes the heat from oxidation of indigestible substance, and the combustion conditions in a calorimeter do not simulate the physiologic activities within the animal body. Relatively accurate factors, 5.65, 9.45, and 4.1, have been established for the heats of combustion of mixed proteins, fats, and carbohydrates, respectively, and energy balance experiments have resulted in acceptance of the factors 4, 9, and 4 as applicable generally in calculating the physiologic fuel values of protein, fat, and carbohydrate in mixed diets, but discrepancies in methods of calculating energy value have been an international problem (33–35).

VARIABLES INTRODUCED BY SAMPLING

To evaluate variations in sampling and analysis, duplicate samples of the diet of one of the children at Holy Family Orphans' Home were obtained for each of seven consecutive days in the spring. The results of the analyses, the differences between them, and the amounts of nutrients calculated to be in each day's diet are given in Table 1. The smallest relative variations between analyses and the most consistent for the seven days were for energy, protein, niacin, and phosphorus. For all other nutrients the differences between analyses varied greatly.

The inconsistency of the results of analyses of duplicate samples using reliable methods and the fact that the differences between results were larger than would be expected from errors inherent in the chemical methods demonstrated variability associated with sampling. The samples analyzed, of course, were taken from the receptacles in which food was prepared for the entire group. Although this method of sampling was the best possible under the conditions, it was impossible to control with any precision the amounts of individual constituents, such as the meat or vegetables in food preparations such as stew. The variation between duplicate samples, therefore, was much greater than studies in which more rigid control is possible. For example, examination of the daily differences revealed that the greatest variation in the fat content of duplicate samples occurred when green beans with bacon fat and fried potatoes were included in the day's diet. Similarly, the largest difference in the carotene content was for a day when vegetable soup containing carrots, rutabagas, tomatoes, and peas was served. Although the samples analyzed were "duplicates," obviously it is impossible to withdraw from a kettle of soup or stew two portions identical in volume or weight which will also have identical distributions of all components. If quantities of the individual food components of a mixed dish were combined in proportions relative to those of the food to be served, cooked separately, and the entire amount taken for analysis, such variations would not be reflected in the results (36). This procedure is costly and in highly controlled studies it is usually more efficient to use menus requiring food preparations amenable to more exact sampling.

Except for the conspicuous differences in analyses of duplicates owing to sampling, the discrepancies between results of the two analyses were generally smaller than the differences between the means of analytical values and the calculated values. In a few instances the calculated values were intermediary to the two values determined by analysis or varied inappreciably. For energy, fat, protein, vitamin A, and thiamine twenty-eight of thirty-three differences showed smaller contents by analysis than were indicated by calculation. Results for phosphorus, niacin, and vitamin C were less conclusive.

ANALYZED AND CALCULATED INTAKES OF CHILDREN

To permit comparison of data obtained by analysis and by calculation of the diets of four children at Holy Family Orphans' Home, mean values obtained by both methods (12) during seven consecutive days in the fall and in the spring are given in Table 2. As

TABLE 1

Comparison of analysis of duplicate samples of diets and calculation of their contents

NUTRIENT	METHOD	DAY						
		1	2	3	4	5	6	7
Energy (calories)*	Analysis							
	Sample a		1968	2297	2512	2018	2051	2384
	Sample b	1521	1941	2277	2553	2075	2032	2411
	Difference		27	20	41	57	19	27
	Estimation†	1516	2152	2260	2674	2238	2288	2339
Protein (gm.)	Analysis							
	Sample a	56.5	76.0	64.4	87.0	68.0	74.4	86.2
	Sample b	53.8	69.7	67.6	85.5	72.8	76.0	85.7
	Difference	2.7	6.3	3.2	1.5	4.8	1.6	0.5
	Estimation	65.6	95.9	75.6	84.5	84.1	83.7	83.6
Fat (gm.)	Analysis							
	Sample a	35.2	37.6	34.7	90.1	35.0	40.8	45.6
	Sample b	36.4	24.2	40.3	87.6	38.9	32.7	45.1
	Difference	1.2	13.4	5.6	2.5	3.9	8.1	0.5
	Estimation	24.2	53.0	42.3	120.8	48.3	55.6	49.6
Phosphorus (mg.)	Analysis							
	Sample b	1270	1422	1430	1705	1387	1357	1596
	Sample a	1138	1315	1495	1816	1484	1398	1653
	Difference	132	107	65	111	97	41	57
	Estimation	1200	1592	1406	1538	1438	1431	1733
Calcium (mg.)	Analysis							
	Sample a	748	708	890	973	698	649	926
	Sample b	742	943	832	903	768	639	813
	Difference	6	235	58	70	70	10	113
	Estimation	908	1139	1006	1131	982	1095	1044
Vitamin A (I.U.)‡	Analysis							
	Sample a	1106	689	5943	1868	1292	567	4787
	Sample b	996	778	6077	1495	963	637	3173
	Difference	110	89	134	373	329	70	1614
	Estimation	2112	1237	6384	3757	2002	1404	4602
Thiamine (mg.)	Analysis							
	Sample a	0.88	0.93	0.98	1.07	1.23	1.24	1.00
	Sample b	0.91	0.91	0.96	1.12	0.98	1.16	0.94
	Difference	0.03	0.02	0.02	0.05	0.25	0.08	0.06
	Estimation	1.14	1.33	1.26	1.14	1.13	1.39	1.22
Riboflavin (mg.)	Analysis							
	Sample a	2.23	2.69	2.69	3.55	3.13	2.79	2.93
	Sample b	2.18	2.75	3.27	3.19	2.64	2.67	3.11
	Difference	0.05	0.06	0.58	0.36	0.49	0.12	0.18
	Estimation	1.83	2.18	1.90	2.25	1.91	1.99	1.74
Niacin (mg.)	Analysis							
	Sample a	11.62	11.44	12.52	15.77	11.77	17.36	18.22
	Sample b	11.61	10.68	12.80	14.66	10.86	17.98	17.10
	Difference	0.01	0.76	0.28	1.11	0.91	0.62	1.12
	Estimation	9.62	12.08	14.04	13.61	10.62	16.56	15.26

* Heat of combustion.

† From standard tables (13–25) by multiplying total intakes of protein, fat, and carbohydrate by factors 5.65, 9.45, and 4.1 respectively.

‡ Micrograms of vitamin A × 4.3 plus micrograms of carotene ÷ 0.6.

TABLE 1—*Continued*

NUTRIENT	METHOD	DAY						
		1	2	3	4	5	6	7
Vitamin C, reduced (mg.)	Analysis							
	Sample a	10	14	28	35	4	49	13
	Sample b	10	24	30	36	3	51	15
	Difference	0	10	2	1	1	2	2
Vitamin C, total (mg.)	Analysis							
	Sample a	54	64	99	72	30	107	60
	Sample b	50	74	96	72	30	107	58
	Difference	4	10	3	0	0	0	2
	Estimation	55	65	108	76	53	112	44

supplemental information the physiologic fuel values obtained from standard tables have been included, as well as the calculated heats of combustion which are directly comparable to the values determined in the bomb calorimeter.

The proper factors to use in converting the results of analyses for vitamin A and carotenoids to International Units of vitamin A activity have not been established, and since the biologic activity of the crystalline vitamin A alcohol employed as a standard was reported by the manufacturer[2] to contain 4,300,000 U.S.P (International) units per gram (37), the factor 4.3 was applied in obtaining the values given in the table. Other investigators (17, 38, 39) have used smaller conversion factors. Micrograms of carotene were converted on the basis of 0.6 mcg. equaling 1 I.U.

SIGNIFICANCE OF DIFFERENCES BETWEEN ANALYSES AND CALCULATIONS

Since the results of analyses in Table 2 represent the composition of food "as eaten," they include the influences of storage, cooking, and serving procedures. Hunter, Kastelic, and Ball (40) found that thiamine estimations agreed fairly well with results of analyses. In an earlier study by this laboratory (41), the estimated intakes of thiamine by twelve lactating mothers were found to be well above the amounts determined by analyses of five-day food composites. In contrast, Kaser *et al.* (27) determined values in the spring which exceeded those obtained by calculation from two sets of standard tables, both of which were compiled from a number of sources and one having been prepared exclusively for use in Tennessee. Lane, Johnson, and Williams (42) found that with cooked "flesh" foods, values from thiochrome assay tend to be low because of incomplete extraction of thiamine. A binding of thiamine to protein can be affected by cooking and also by low temperature dehydration.

Kaser *et al.* (27) both in the fall and in spring found higher riboflavin values by analysis than by estimation. For the children in this study the principal source of riboflavin was the large quantities of milk consumed. Riboflavin levels estimated by Kaucher *et al.* (41) for the diets of lactating mothers approximated the values obtained by analysis. Most of the milk used at Holy Family Orphans' Home was obtained from one herd of cows, and the riboflavin content may have differed appreciably from concentrations for "market milk" included in published tables.

In Table 3 is shown the distribution of the results of analyses of the daily food intakes of the children (Table 2) compared to calculations, as well as the results of statistical calculation of significant differences.[3] A striking illustration is presented of the

[2] Distillation Products, Inc.

[3] The applicability of several tests of significant difference was explored in an effort to define more accurately the variation between the calculated and analyzed data for diet composition. The x^2 test was rejected because it is limited to frequencies, and its use would not permit comparison of the pairs of figures obtained by calculation and by determination. The use of the "t" test would introduce an additional assumption, since it presupposes a normal distribution of values. In the procedure adopted, the following hypothesis was tested: if there were no appreciable difference between analyzed and calculated values, the differences obtained between individual pairs of values would be positive or negative with equal likelihood. This is equivalent to assuming a binomial distribution of the signs of these differences, with probability $p = \frac{1}{2}$. Thus the probability P of obtaining r differences in one direction is given by $P(r) = \frac{n!}{r!(n-r)!} p^r q^{(n-r)}$ when n is the total number of observations.

In this case the distribution is symmetric, $p = q = \frac{1}{2}$ and to determine the 99 per cent critical value, it is necessary merely to calculate a 0.5 per cent tail of the distribution given by $P(x < r) = .005 = p^n \sum_{x=0}^{r} \frac{n!}{x!(n-x)!}$

For $n = 28$, this yields a value of $r = 7$, which represents a lower critical region of $x < 7$, corresponding to an upper critical region where $x > 21$. Accordingly, for a series of 28 pairs of values, the difference is significant at the 99 per cent level if the ratio of positive and negative differences between corresponding values is less than 7:21 or greater than 21:7.

TABLE 2

Average daily intake per week

NUTRIENT	FALL				SPRING				
	Leroy	Robert	Donna	Judith*	Ronald	Robert	Donna	Judith†	Shelby‡
Energy (heat of combustion) (calories)									
Analyzed	2131	2189	2432	1962	1825	2112	2301	1801	1948
Estimated§	2038	2110	2329	1894	1883	2210	2348	1770	2006
Physiologic fuel value (calories) ‖	1854	1918	2115	1727	1708	2009	2130	1569	1823
Protein (gm.)									
Analyzed (N × 6.25)	80.4	80.7	91.6	72.9	63.9	73.1	80.3	73.5	70.3
Estimated	77.6	80.4	89.7	69.5	74.3	81.8	91.2	93.0	76.0
Fat (gm.)									
Analyzed	58.0	57.4	63.7	51.8	31.6	44.6	43.6	26.2	38.4
Estimated	45.5	48.0	50.4	43.9	40.9	56.2	53.7	31.3	50.0
Calcium (mg.)									
Analyzed	1232	1293	1394	1227	848	802	941	1031	890
Estimated	1254	1242	1498	1138	1120	1044	1267	1234	1161
Phosphorus (mg.)									
Analyzed	1650	1572	1831	1599	1315	1462	1668	1454	1391
Estimated	1538	1564	1807	1377	1402	1477	1688	1628	1431
Vitamin A (I.U.)									
Analyzed #	5994	6219	7222	4654	2056	2166	2522	1110	1850
Estimated (13–25)	3549	4496	4119	2653	2830	3071	3279	1557	2463
Estimated (17)					1761	2036	2162	1293	1645
Thiamine (mg.)									
Analyzed	1.13	1.18	1.35	1.08	0.88	1.02	1.12	0.94	1.01
Estimated	1.56	1.58	1.78	1.41	1.11	1.23	1.35	1.29	1.09
Riboflavin (mg.)									
Analyzed	2.67	2.75	3.41	2.72	2.74	2.84	3.22	2.68	2.91
Estimated	2.32	2.32	2.70	2.03	2.04	1.97	2.34	2.39	2.09
Niacin (mg.)									
Analyzed	14.60	13.98	16.87	12.83	10.22	13.88	13.80	11.17	12.41
Estimated	11.68	12.01	12.86	9.78	10.79	13.11	13.54	12.86	11.63
Vitamin C (mg.)									
Analyzed	56	56	74	57	66	70	71	56	61
Estimated	62	65	78	64	63	73	78	56	60

* 6 days.

† 2 days.

‡ 4 days.

§ From standard tables (13–25) by multiplying total intake of protein, fat, and carbohydrate by factors 5.65, 9.45, and 4.1, respectively.

‖ From standard tables (13–25).

Micrograms of vitamin A × 4.3 plus micrograms of carotene ÷ 0.6

variation inherent in calculations of nutrient intake when standard food values are used without regard for factors such as season. The differences between analyzed and calculated values for thiamine and riboflavin in twenty-eight diets in the fall and the same number in the spring were significant. More important, the differences were in the same directions, that is, a significant number of analytical values for riboflavin were higher than the calculated amounts *both* in fall and spring, and for thiamine were lower *both* in fall and spring. When all determinations in both fall and spring were combined, disregarding season, only the results for thiamine and riboflavin showed differences between analysis and calculation which were significant.

The results indicated good agreement between determined and estimated values for heat of combustion, as has been shown by other authors (14, 29, 43). In neither season were the fat intakes estimated from food composition tables in close agreement with the actual amounts of fat ingested, emphasizing the great variations in the concentration of this constituent in foods. Similarly large differences between estimated and determined amounts of fat in diets were found by Hummel *et al.* (44), Patterson and McHenry (29), and Bransby, Daubney, and King (43). The differences in values for fat were highly significant for both seasons, but because the directions were opposite, any significance would be obscured without separation of the fall and spring values (Table

TABLE 3

*Distribution of values from analyses of fifty-six daily food composites in relation to values estimated from weighed amounts of food in the composites**

NUTRIENT	NUMBER OF ANALYSES IN THE FALL			NUMBER OF ANALYSES IN THE SPRING			NUMBER OF ANALYSES IN THE FALL AND SPRING		
	Higher than estimated values	Lower than estimated values	Significant difference	Higher than estimated values	Lower than estimated values	Significant difference	Higher than estimated values	Lower than estimated values	Significant difference
Energy †	21	7	No	10	18	No	31	25	No
Protein	19	9	No	4	24	Yes	23	33	No
Fat	27	1	Yes	5	23	Yes	32	24	No
Calcium	16	12	No	0	28	Yes	16	40	No
Phosphorus	19	9	No	9	19	No	28	28	No
Vitamin A									
Using standard tables (24–36)	25	1	Yes	7	21	No	32	22	No
Using Booher (28)				12	16	No			
Thiamine	0	28	Yes	1	27	Yes	1	55	Yes
Riboflavin	25	3	Yes	28	0	Yes	53	3	Yes
Niacin	24	4	Yes	17	11	No	41	15	No
Vitamin C	10	18	No	9	19	No	19	37	No

* Diets which were eliminated from consideration in other tables because of Judith's illness were included in the determination of variation between analyzed and calculated values.

† Heat of combustion.

3). For fall diets, twenty-four niacin analyses were higher than the calculated values, four were lower—a significant difference. In the spring, seventeen of the analyzed diets were higher, eleven lower, than calculated niacin values—a parallel relationship but not of significant difference. A sufficient number of "lower" values were included to make the difference between all analyzed and calculated values for niacin non-significant. For all other components (energy, protein, calcium, phosphorus, and vitamin A), the greater number of analytical values were higher than respective calculated values in the fall and lower than corresponding calculated values in the spring, eliminating the possibility of any significant differences in fall or spring diets from being reflected in the data for all diets.

By season, other differences between analyzed and calculated intake were significant: in the fall for vitamin A and niacin, and in the spring for protein and calcium. The protein contents determined by analysis tended to be higher in the fall but the difference was not significant, while by estimation protein was significantly higher in the spring. However, since milk contributed significant amounts of protein to both the fall and spring diets, it is possible that a difference in quantities of protein contributed by milk at the two seasons in part accounted for the difference between analyzed and calculated values changing from non-significant to significant. Bransby, Daubney, and King (43) reported analyzed protein values which were significantly higher than the calculated. Other investigators (29, 41, 44) found calculated and analytical values in agreement with each other.

For all diets in the spring, the estimated amounts of calcium exceeded the quantities determined by analysis, but there was no significant difference between the values for the fall diets obtained by the two methods. This would indicate that the standards employed were more representative of the composition of the foods in the fall diets. Comparing the actual results obtained by the two methods, there was almost perfect agreement in the fall, a mean daily analyzed value for four children of 1286 mg. as compared to 1283 mg. obtained by calculation. The discrepancy between the spring values, however, was significant: 902 mg. by analysis, and 1165 mg. by calculation, indicating that values selected in the food tables used were more representative of the combination of foods eaten in the fall than of those eaten in the spring. Since milk contributed 81 per cent of the dietary calcium and all of the milk came from a single herd of cows, a large seasonal difference in the calcium content of milk is conceivable. The tendency for estimates of the dietary calcium to exceed the real values has been demonstrated by Semmons and McHenry (45) and Bassett and Van Alstine (46). Gutman and Low (47) found this tendency more consistently in low-calcium diets than in intermediate- or high-calcium diets and cautioned against the use of food tables when precision measurement of calcium intake is required.

The differences between the estimates and determinations of phosphorus intake were not significant for either season, but the trends of the differences were similar to those of calcium, supporting the belief that the changes were the result of differences in the calcium and phosphorus contents of the milk.

The calculated estimates of the vitamin A activity of the children's diets provided an opportunity to demonstrate the alterations in results which may occur as a result of using different standard tables. The content of the spring diets (Table 2) was calculated from two sources of values for the vitamin A activity of foods. With standard tables (13–25), the vitamin A activity of the diets was 20 to 30 per cent greater than indicated by actual analysis: with the other source (17), from which were selected values representing methods, conditions, season, and supplies most nearly representative of the situation at Holy Family Orphans' Home, four of five values were smaller than comparable analytical values. In other comparative studies (27, 40, 41) estimated levels of vitamin A were greater than analyzed values. Kaser *et al.* (27) observed large differences in the fall between the two methods of evaluating vitamin A content. They also found that for vitamin A and other vitamins as well, estimations corresponded more closely with data from determinations at low levels of intake than at higher levels.

The niacin contents of the diets also showed that the amounts of the vitamin ingested in one season (spring) were more accurately represented by estimation from standard tables than they were in the fall. Kaser *et al.* (27) found that, by using one source of food composition data, estimations exceeded determined contents but with another source the reverse was true. Kaucher *et al.* (41) did not find a significant difference between results obtained with the two methods of evaluating intakes of this vitamin.

The ascorbic acid determined in the fall diets approximated the amounts ingested in the spring, and the estimates approximated the true quantities for both seasons. Young and McHenry (30) compared results of analyses of mixed diets (twenty-one meals high in fruits and vegetables) for total ascorbic acid with data computed from three tables of food composition. The quantities estimated with one table agreed much better with the results of analysis, the average difference being only 7.6 mg. in contrast to two and five times that amount for values based on the other two tables. The influence of the repeated introduction of an incorrect value from food tables was demonstrated. A high value for turnip greens in one food table resulted in estimates of vitamin C intake much higher than shown by analysis of diets containing large amounts of the greens. However, when a table (27) was used in which allowances had been made for losses of vitamin C during cooking, better agreement was obtained.

SUMMARY

Comparison of data obtained by analysis and by calculation from standard tables of food composition showed that in diets eaten by two groups of four children, in fall and in spring, the results for fat, riboflavin, and thiamine were significantly different in both the fall and spring seasons. For protein, calcium, vitamin A, and niacin, the values for food intake in one season differed significantly. Determinations of energy, phosphorus, and ascorbic acid by the two methods did not demonstrate significant differences. Consistent differences for fat, riboflavin, and thiamine indicated that values selected from the tables did not approximate the true values in either season. Good agreement between analyzed and calculated values indicated that under the conditions, the tables used gave fair estimate of energy, phosphorus, and ascorbic acid.

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Salmonella *in Hen Eggs*

Although hen eggs as a source of *Salmonella* infection have been incriminated in only a few instances, the possibility of the transmission of this organism by serving uncooked eggs should be recognized. One hundred eighty-six samples, representing 247 doz., or 2964 eggs, taken from 56 cases were examined. Positive cultures were obtained from 6 samples (or 3.2 per cent of the samples). Each positive sample came from a mixture of 1 doz. eggs. Under the procedure, the infection could come from the contents or from the shells of the eggs. The finding in this study emphasizes that the potential hazard of infection from uncooked eggs, is greater than heretofore recognized.—*Abstracted from Public Health Reports 65: 788 (June 16), 1950.*

Ascorbic Acid Retention and Palatability of Cabbage as Cooked in South India[1]

MARY BROWN PATTON, RAJAMMAL DEVADAS, AND EVA DONELSON WILSON

School of Home Economics, The Ohio State University, Columbus

GREEN leafy vegetables are relatively inexpensive and easily available throughout the year in the south of India, and they are important as a means of improving the poor diet there (1). Since these vegetables are the important sources of ascorbic acid in a South Indian diet, it is pertinent that the retention of this vitamin as influenced by the cooking methods followed there be investigated. The two most common methods of cooking in South India, boiling and panning, were used in the present study.

The retention of ascorbic acid in cooked vegetables is considered by some workers to be one criterion of their quality. If this vitamin is retained, other food nutrients, aroma, color, texture, and flavor will also be retained (2–4).

Cabbage was the vegetable selected for study because it is used in South India and was available for the investigation. The methods of preparation used approximated as nearly as possible those used in homes in India.

EXPERIMENTAL PROCEDURE

Cabbage of an unknown variety, sufficient to last throughout the study, a period of ten days, was purchased in the local market and stored in the refrigerator at 40°F. Consequently, the length of storage varied from one to ten days. Refrigerator storage, even up to two months, has been shown to cause little loss of ascorbic acid (4–7).

Cabbage was finely cut with a stainless steel knife on a wooden cutting board, the central core and thick stems being discarded. The whole head was first cut into quadrants, and then each quadrant was cut into pieces approximately ½ in. by ½ in. The sample was weighed and washed with 2000 cc. distilled water.

The washing after cutting was done to simulate the Indian method. The question of the effect of standing in air or water on the ascorbic acid content of cut cabbage was studied by McKay and Patton, (7) who found that shredded cabbage showed little loss of ascorbic acid when allowed to stand 1 hr. in air, or 1 to 3 hr. in water. Van Duyne *et al.* (9) similarly found that losses in ascorbic acid content owing to advance preparation, that is shredding and allowing to stand for 1 hr. in air or for 1 to 3 hr. in water, did not exceed 6 ± 1 per cent.

Three hundred fifty cc. wash water adhered to the cut cabbage, as determined by weighing the sample before and after washing. A 400-gm. portion of the washed cabbage was cooked by each of the methods in aluminum pans of identical size and weight. The cooking was done on a temperature controlled electric hot plate. Four replications of each method were completed.

The cooking procedures used simulate common home practices in India. There were two methods of boiling: (a) with just sufficient water to leave the vegetable dry at the end of the cooking period, and (b) with an excess of water. The method known as "panning" was also used. They were designated in this study as the "boiled," the "boiled-drained," and the "panned," respectively. By the procedure indicated as "boiled-drained," 400 gm. cabbage were boiled in 1200 cc. water for 15 min. after the water had returned to a boil. The excess of water was drained from the sample.

By the procedure designated as "boiled," 400 gm. cabbage were boiled in 250 cc. water for 15 min. after it had returned to a boil. No extra water remained to be drained from this sample.

In the "panning," procedure, 20 gm. peanut oil were heated for 2 min., reaching a temperature of 80° C.; 400 gm. cabbage were added and stirred with a perforated stainless steel ladle for 15 min.

All samples were cooked uncovered and the total weight recorded immediately after cooking. The water was drained for 1 min. from the boiled-drained sample before weighing. Aliquot portions of each lot ranging in weight from 25 to 30 gm. were taken in duplicate for the ascorbic acid determinations. Four replications of each method were done.

[1] Received for publication January 5, 1949.

The Morell method for determining reduced ascorbic acid using the Waring Blendor for extraction was employed, and the readings made in an Evelyn photoelectric colorimeter. The products were judged for appearance, color, moisture, texture, and flavor by a panel of three judges.

RESULTS AND DISCUSSION

The total length of the cooking time varied with the methods, 30 min. for the boiled-drained samples, 22 min. for the boiled, and 15 min. for the panned. With the larger amounts of water, as in the boiled-drained sample, 15 min. were required for the water to return to a boil after adding the cabbage; 7 min. in the case of the boiled sample.

The mean ascorbic acid value of four replications of the fresh sample was 34.8 mg. per 100 gm; for the boiled-drained, 11.4 mg.; for the boiled, 28.4 mg.; for the panned, 26.3 mg. The cooking water from a 100-gm. portion of cooked cabbage contained 16.9 mg. ascorbic acid. The boiled-drained sample retained only 23.8 per cent of the ascorbic acid originally present; the sample with no cooking water to discard, designated as boiled, retained 81.6 per cent, and the panned sample retained 75.6 per cent.

There was a highly significant difference in ascorbic acid retention between the boiled-drained and boiled samples and between those boiled-drained and panned, but not between boiled and panned samples as indicated in Table 1 (10). The shorter cooking times for the boiled and panned cabbage, and the small amount of water used in the boiled sample contributed to the higher retention of the vitamin in the products prepared by these methods. The panned samples, although cooked for the shortest period of the three methods, retained less of the vitamin than the samples boiled in a small amount of water.

The results of the subjective evaluation indicated that cabbage boiled in a small amount of water was the most desirable in color and the method of panning cabbage the least desirable. The texture of the boiled cabbage was most desirable, whereas the flavor of the panned cabbage samples was rated superior to the others. The samples boiled in a large amount of water and drained were judged least desirable subjectively and were found to have the least ascorbic acid.

TABLE 1

Significance of the difference in ascorbic acid retention in cabbage cooked by three different methods in South India

COMPARISON	F VALUE
Fresh *and* boiled-drained	25.00**
Fresh *and* boiled	1.27
Fresh *and* panned	2.89
Boiled-drained *and* boiled	19.74**
Boiled-drained *and* panned	28.00**
Boiled *and* panned	0.24

** Highly significant difference.

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Evaluation of Interviewing Techniques

Florence Smith, a dietetic intern at the Veterans Administration Center, Los Angeles, writes concerning her experiences with the study of interviewing techniques using a wire recorder.

The permanent record of interviews provided verbatim accounts from which it was possible to obtain more precise and detailed records of interviews than would have been possible in attempting to remember afterwards what had been said.

Miss Smith was able to obtain the consultant services of a specialist from the Social Service Department to assist her in evaluating one of three different interviews and to outline a plan for improvement in technique. The recordings served not only to benefit Miss Smith, but they will be used also to give tangible examples of interviewing to classes and groups of dietetic interns. This demonstration type of interview proved to be an effective device to study the application of principles and techniques which were learned in internship.

LILLIAN STORMS COOVER

President of The American Dietetic Association

Editorial

LILLIAN STORMS COOVER PRESIDENT OF THE AMERICAN DIETETIC ASSOCIATION

The American Dietetic Association is proud of the women who have been elected to responsible leadership in the office of President. They have been women of professional experience, clear thinkers with vision, leaders in professional advancement, and skilled administrators.

The new President, Lillian Storms Coover, is well qualified to carry on the traditional high standards set by her predecessors. From a family of teachers and scholars, she brings a background of experience as college teacher, research worker, and world traveler, coupled with the humanizing touch of a charming personality and a sparkling sense of humor.

Lillian Storms was born in Tipton, Michigan, where her father was the Methodist minister. Her elementary and high school education was obtained in schools in Detroit; Madison, Wisconsin; and Des Moines, Iowa. A minister's family learns to adjust to new communities and know how to make friends, and Lillian Storms' gift of friendliness and ability to make a home wherever she is, probably stems from these childhood experiences. Her father, Dr. Albert B. Storms, was also an educator and was President of Iowa State College from 1903 to 1910. Later he was President of Baldwin-Wallace College in Berea, Ohio. Her mother, Lovie Whitcomb Storms, had been a teacher, too, having spent some years at the Indian Reservation School in Walla Walla, Washington—and that was in the days when the last part of the journey west had to be taken by coach. It is hardly surprising that Lillian Storms grew up with a love of learning and a love of travel that was eventually to take her around the world.

Lillian Storms took her bachelor's degree at Iowa State College and her master's from Teachers College, Columbia University—with nutrition work under Mary Swartz Rose. From 1918 to 1922 she taught in the Chemistry Department at Iowa State College. Then she returned to Columbia University, where she obtained a doctorate under Dr. Henry C. Sherman in 1924. On completion of this degree she was offered a position as Assistant Professor of Home Economics at the University of Otago, New Zealand.

The lure of far-off countries could not be resisted and the years from 1924 to 1927 were spent in New Zealand. There at the University, Dr. Storms established in the Home Economics Department, a program of nutrition research and graduate work in nutrition and taught chemistry and nutrition to undergraduates in home economics. Vacations were spent in travel, and she saw more of New Zealand than many New Zealanders do. She was one of three women in a mountaineering party, the first woman to cross New Zealand's Grave-Talbert Pass. Visits to Australia and Java were also entered in her travel diary.

When a young New Zealander returned with her doctor's degree from Columbia University, Dr. Storms turned the nutrition program over to her and set out again for the United States. Australia, Egypt, Palestine, Turkey, Greece, the Adriatic Coast, and Italy were visited on the way. Travel continues as a major hobby for her, along with color photography and the collecting of Japanese ivory netsuke.

When she returned to the United States from New Zealand, Lillian Storms entered the business field as a nutritionist. For fifteen years she served as Nutritionist and Director of Research for the Gerber Products Company. She was Chairman of the Home Economics in Business Section of the American Home Economics Association in 1935–36.

In 1945 Lillian Storms was married to Dr. Winfred F. Coover, Head of the Chemistry Department of Iowa State College. A busy homemaker, charming hostess, and keen gardener, Mrs. Coover continues her professional activity in the American Dietetic Association and as Nutrition Consultant on the Research Committee of Gerber Products Company.

Lillian Storms Coover comes to the office of President of the American Dietetic Association with wide experience in the educational, business, and professional world and with a thorough knowledge of the workings of the Association. She has held the following offices in the Michigan Dietetic Association: President, Treasurer, and Delegate. In the national Association, she was Vice-President and Chairman of the House of Delegates, 1943–45; Secretary, 1946–48; Chairman of the Membership Committee, Community Education Section, and Nominating Committee. She has been a member of the Investigation Board, Membership Committee, and Reorganization and Constitution Committee.

Mrs. Coover is a member of Sigma Xi, Iota Sigma Pi, and Sigma Delta Epsilon. She has published research papers in *Transactions and Proceedings of the New Zealand Institute* and the *Journal of the American Chemical Society*, and scientific papers in the *Journal of Home Economics*, JOURNAL OF THE AMERICAN DIETETIC ASSOCIATION, and the *Iowa State Journal of Science.*—*E. Neige Todhunter, Ph.D., University of Alabama, Tuscaloosa.*

Current Comment

THE AMERICAN DIETETIC ASSOCIATION CONTRIBUTES TO THE HEALTH OF CHILDREN AND YOUTH

ERCEL S. EPPRIGHT, PH.D.

Head, Department of Foods and Nutrition, Iowa State College, Ames, and *Chairman, Professional Education Section, The American Dietetic Association*

Every ten years in this century the people of our country have considered, in an organized way, the welfare of their children. At these intervals they have in a sense taken stock of the problems involved in improving conditions with our youth.

These occasions have been known as White House Conferences. This year in December the Mid-Century White House Conference on Children and Youth is being held. With the progress which has been made in understanding the physical needs of the child, it seems appropriate that the emphasis of the conference should be directed toward the "mental, emotional, and spiritual qualities essential to individual happiness and to responsible citizenship" together with the "physical, economic, and social conditions" deemed necessary to this development. The scope of the conference is broader than ever before. This also is appropriate in the light of our increasing knowledge. It is a challenge to integrate the learning in all fields and to direct it simultaneously toward the well-being of the child. To the dietitian and the nutritionist, it means that she can no longer think of her job as merely that of feeding the child. She must think of her work in relation to the total development of the child.

The American Dietetic Association is one of the cooperating organizations in the White House Conference. Each participating group has been asked to consider the objectives in the light of the purpose of the conference. The contributions of the dietetic profession to the physical welfare of the child are obvious, but the relation to the "mental, emotional, and spiritual development" is not always evident, particularly to people not directly engaged in the work. Thus, it seems worth while to think of the objectives of the Association and to attempt to analyze their relationships to the "focus of the conference."

The stated objectives of the American Dietetic Association are:

(a) To improve the nutritional status of human beings.

(b) To raise the standards in dietetic service.

(c) To protect the status of the profession.

(d) To foster cooperation between members and workers in allied fields.

Each objective will be considered with its implications for the mental, emotional, and spiritual development of children.

IMPROVEMENT OF THE NUTRITIONAL STATUS OF HUMAN BEINGS

We have long recognized that improvement of nutritional status is fundamental to the physical health of the individual. Growth, maturation, reproduction, and buoyant health depend on the nutrients supplied in the daily diet. Mental health, personality development, ability to learn, security, and happiness in the home likewise hinge on nutrition. The foundations for an abundant life are determined to a large extent by the food of the child and the mealtime practices in the home. Food is of equal importance to the large number of children living in institutions, where good meals, pleasantly served, help to bridge the gap between the normal home and the institution.

The first process which relates the newborn child to the mother is feeding, and the success of this operation is important both to the mother and child. The members of the American Dietetic Association are actively engaged in efforts to improve infant nutrition. Their programs of work are projected through hospital dietetics, research, and educational projects with expectant mothers.

Throughout childhood food provides for the bodily needs and symbolically conveys the love of the parents. Today the family dinner table stands almost alone as a unifying force in the home. Meal-time remains the one occasion when the family comes together; it satisfies spiritual as well as physical needs. Nutritionists offer help of various types to homemakers who are interested in providing meals which will more fully satisfy families' needs.

Good nutrition is one of the tangible safeguards against juvenile delinquency. Research has shown that malnutrition dwarfs the personality, develops introverts, destroys self-confidence, fosters mental depression, unrest, and crime. This has been observed in controlled laboratory situations and on a large social scale. Healthy bodies help to produce healthy minds even under adverse environmental conditions. Although we do not understand as yet the biochemical basis of behavior problems, the relationship is known to exist. Nutrition is the bio-

chemistry of the body and fundamental, therefore, to the way we think and act, as well as how we feel.

Improving the nutritional status of the children of our country would mean raising them from a level of mediocrity to one of superiority. Outright dietary deficiency diseases are rare among our people, but, on the other hand, children who measure up to a high standard of excellence in every respect are also in the minority. The application of nutritional knowledge to children might be expected to effect vast improvements in their health and well-being.

The American Dietetic Association seeks to secure wider application of the knowledge in nutrition to all human beings. Some of the ways in which it is attempting to carry out the objectives are:

(1) By disseminating nutrition information through this JOURNAL, which reaches some 11,000 people; through certain books and manuals that have been published under its auspices; through national and state meetings planned to promote interchange of ideas and to keep the membership up to date with the recent developments in the field.

(2) By maintaining high standards for the college or university preparation of its members, particularly in nutrition and in the basic sciences.

(3) By maintaining high standards for institutions which qualify as places in which students may take an internship.

(4) By cooperating with other professional groups (particularly physicians and dentists) and with numerous agencies concerned with the application of nutrition.

(5) By carrying on projects designed to advance the objects of the Association, such as:

(a) Preparation of a "Nutrition Bibliography" which includes sections on nutrition in pregnancy and lactation, nutrition of the preschool child and of school children.

(b) Evaluation of child feeding practices in the hospital. A survey of eighty-nine hospitals in 1947 and '48 indicated a need to encourage a more liberal attitude toward the child and his food and to adopt a plan of hospital feeding by which the child's needs could be individually considered.

RAISING THE STANDARDS OF DIETETIC SERVICE

In order to make more effective application of the present knowledge of nutrition, the Association is constantly striving to raise the standards of dietetic service through four main channels:

(a) The undergraduate college requirements for membership.

(b) The internship, or fifth year of post-graduate training for college graduates.

(c) Various projects undertaken by the four sections, namely, Community Nutrition, Diet Therapy, Food Administration, and Professional Education.

(d) Workshops, institutes, refresher courses, and the annual meeting.

Throughout these programs emphasis is given the needs of children and youth under twenty-one.

In the undergraduate academic preparation, units in child nutrition, food for the family, diet for children's disorders, and experience in food service units involving children and youth are invariably included. These requirements are under constant study.

Hospital internships include units of training in pediatrics. The internships, originally offered by hospitals, have been extended to colleges, industrial plants, and are now being considered for the school lunch administration. Such opportunities for training largely concern children and youth under twenty-one. In the industrial plant service, emphasis is given family consultation as well as the group feeding.

The Association administers the award of a limited number of scholarships and fellowships. It offers advisory assistance to foreign students who wish to come to this country to study dietetics and to take internships. Thus indirectly the Association is instrumental in furthering work with children in other countries, too.

Some of the projects undertaken by the sections directly concern the standards of dietetic service. Examples are as follows:

(a) Training programs for subsidiary workers.

(b) Consultation service to hospitals without trained dietitians.

(c) Workshops and institutes for in-service training of workers who do not have an opportunity to return to school for advanced study or to keep up to date in the constantly increasing body of knowledge.

The fact that a professional dietitian is required as a staff member of hospitals approved by the American College of Surgeons does much to raise the standards in dietetic service.

PROTECTING THE STATUS OF THE PROFESSION

Protecting the status of the profession also in a measure safeguards the nutrition of children and youth. Through increasing the scope of service and prestige of nutrition workers, the application of nutrition is gaining ground. Food service is elevated to a professional basis which further assures the application of the scientific knowledge and raises it from the level of merely filling the empty stomach.

There are many unqualified practitioners in nutrition together with the flood of marketed products making dietetic claims. It is important that the Association be alert to quackery and false claims. Through sponsoring an official definition for "dietitian" and through careful screening of products advertised in the JOURNAL, it is able to exert a limited protection.

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FOSTERING COOPERATION WITH ALLIED GROUPS

For three years the Association has been actively engaged in a public relations program designed to interpret our contributions to lay people and to foster cooperation between members and workers in allied fields. Throughout its history, the Association has been integrated with the medical field and with nursing. The services of the three groups are highly interrelated. Several projects have pertained to the contribution of the dietitian to the nutrition education of doctors, dentists, and nurses. The dietetic field is closely related to science, especially chemistry, to economics, and to agriculture. It follows that there are many cooperative projects relating dietitians to workers in these fields.

SCOPE OF SERVICES FOR CHILDREN

The organizations have been asked to give some estimate of the scope of services rendered to children by its members. Combining data concerning the distribution of members among various fields and approximate number of children served in each, it is estimated that the members of the American Dietetic Association are serving about 7 million children, or 12.5 per cent of the total census of children and youth under twenty-one years of age (Table 1).

TABLE 1

*Estimate of services to children by members of the American Dietetic Association**

TYPE OF WORK OF MEMBERS	NUMBER OF MEMBERS	APPROXIMATE NUMBER OF CHILD CONTACTS
Hospital dietetics	3,570	3,927,000 children 2,700,598 births
School and college food service	595	59,500
Teaching in home economics and nutrition departments	680	71,400
Community nutrition in public and private agencies	425	10,625
Homemaking	1,445	2,890
Miscellaneous	425	10,625
Total	7,140†	6,782,638

* Figures furnished by Ruth M. Yakel, Executive Secretary, the American Dietetic Association.

† 83 per cent of membership of American Dietetic Association, May 31, 1950.

An important contribution to child welfare is embodied in the papers in the JOURNAL.

A survey of the articles published between 1940 and 1950 revealed 153 articles dealing directly with children. These include information on the nutritional needs of children of all ages, nutritional status studies, and much information on special conditions of childhood, such as dental caries, diabetes, rheumatic fever, and obesity. A considerable number of articles has been related to the psychologic aspects of nutrition and the contribution which nutrition can make to the health and well-being of the child, as well as the school lunch.[1]

Each organization has been asked to analyze its problems and needs with respect to advancing the purpose of the Conference. For the American Dietetic Association these fall in four areas: personnel, research, education, and financial.

Finally the following recommendations for continuing the work of the Conference have been made:

(1) The following subjects should be brought into focus at the December meetings.
   (a) The significance of nutrition to the mental, emotional, and spiritual well-being of the child.
   (b) The malnourished child as a social liability.
   (c) The prevalence of malnutrition among the children of this country.
   (d) Major conditions contributing to malnutrition of children.
   (e) Measures needed for improving nutrition of children.

(2) Reports should be popularized in such a way as to arouse the entire nation to a greater consciousness of what can be accomplished by nutrition.

(3) Nutrition should be an integral part of all state and community follow-up conferences.

(4) Legislative measures needed to improve the nutrition of children should be considered: examples, enrichment laws and reduction of taxes on such vital foods as milk.

(5) Consideration should be given to appropriations needed to expand the educational activities and research projects of goyernmental agencies concerned with nutrition.

(6) Standards should be established in institutions caring for children which would ensure good nutrition. Provision for good nutrition should be of no less concern than sanitation.

(7) An all-out effort should be made to raise the level of our child life today from mediocrity to superiority. People should be made aware of standards which children should attain.

(8) Nutrition education should be made an integral part of health education in the schools. Curricula for training teachers should include elementary nutrition education.

(9) Other professional workers engaged in working with children should have basic knowledge of nutrition.

(10) The Conference should lead to action, not merely the accumulation of more reports.

These recommendations may carry suggestions for local and state committees in their follow-up work, which is as important as the Conference itself.

[1] List of references available on request.

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Book Reviews

The Art and Science of Nutrition. By Estelle E. Hawley and Grace Carden. 3rd ed. St. Louis: The C. V. Mosby Company, 1949. Pp. 700. Cloth. Price $4.75.

This book continues to be a good reference book for those interested in the field of nutrition. It includes sections on normal nutrition; food requirements under special conditions, such as pregnancy, lactation, infancy, children, and old age; diet therapy; laboratory lessons in the choice, preparation, and serving of foods; and an appendix.

The section on normal nutrition is written for students with a background in chemistry. It follows an informative textbook style. It would be better as a reference than as a text for the student nurse because she would need to be motivated before she started reading. The information given is clear, accurate, and concise.

The chapter on proteins is especially good. At the end of each chapter on proteins, fats, and carbohydrates are paragraphs giving excellent descriptions of the principal foods of each food group.

The physiology of digestion, of blood and lymph, and of the endocrines is well explained, but specific dynamic action in the chapter on metabolism cannot be clearly interpreted. The physiology of acid base balance, however, is given a detailed, but comprehensive explanation.

Clear-cut informative charts accompanying the section on vitamins illustrate which foods are best sources of each vitamin. The latest developments in vitamin research are summarized. The significance of biosynthesis and of the anti-vitamins is discussed.

Infant feeding is explained from the composition of the formula to the psychological factors involved in adding other foods.

The diet therapy section includes practically every disease or condition that can be treated by diet. The pathological conditions are explained in a short, concise manner with quotations from authorities in the various fields. The terminology is at the right level to be understood by the student nurse.

An outline for the suggested correlation of lectures and laboratory lessons is in the part of the book dealing with food preparation. The material is presented so that it can be used just as it is in teaching a laboratory class.

Listing the subjects of some of the tables in the appendix shows the variety of the data presented: food composition tables which include foods not often given as Klim, koumiss, Dietene, rice flour, and Heinz junior foods; Donelson and Leichsenring's short method of dietary analysis; family food plans at low and moderate cost; allergy recipes; characteristics of the eating habits of certain nationalities; two tables giving salt content in food, one detailed, the other summarizing; and salt content in water in cities of the United States.

A book which makes such a successful attempt to cover the field of nutrition and diet therapy must necessarily omit much detail. References are given for those who wish to pursue the subjects further.—*Berdena Rosenow, University of Kansas Medical Center, Kansas City, Kansas.*

Jewish Cooking. By Leah W. Leonard. New York: Crown Publishers, 1949. Cloth. Pp. 464. Price $3.

Written by Leah W. Leonard, an authority on Jewish cookery who edits a syndicated column in Jewish American newspapers, *Jewish Cooking* is more than a recipe book. Four chapters are concerned with Jewish holidays and their food associations, including recipes for these foods. Kosher kitchen questions are answered. Interesting facts and recipes from Israel make up a chapter. The small section on nutrition, however, is sketchy and is presented in rather clumsy form.

The recipes come from all over the world and cover all areas of Jewish cookery. They are presented in simple, useable form. The author says that all recipes have been tested using modern techniques and equipment.

Just reading through the book brings exclamations: "Um-m, this would be delicious," "I must try this for such-and-such an occasion," and so on. Amid this variety of food ideas there must be some answers for anyone who wants to liven up her menus.—*Mary Brakel, Director, Food Clinic, Mandel Clinic, Michael Reese Hospital, Chicago.*

Meat and Meat Foods. By Lloyd B. Jensen. New York: Ronald Press Company, 1949. Cloth. Pp. 218. Price $3.75.

"Processing and preservation from meat plant to consumer," the sub-title of this book, is an indication of the vast amount of information Dr. Jensen has included. With a background of teaching bacteriology at the Mayo Clinic and the University of Chicago, being chief bacteriologist of a large meat packing company (his present position), as well as serving as editor of *Food Research*, he has accumulated considerable data of interest and value to all in the food industry. The findings on meat of many chemists, bacteriologists, veterinary scientists, engineers, and operating men in meat plants have been brought together under one cover.

Explanation is made of every stage of operation from the chilling of fresh meat in the plant to its actual preparation in the kitchen. Of even more value than these details are reasons for each of the steps in processing and preservation.

Sections which will be of special interest to those concerned with food preparation deal with storage, handling and aging of fresh meat, freezing of meat and freezer storage, curing and smoking, processing and care of canned meats, and the history of sausages.

The section on meat cookery and meat in the diet explains recommended procedures of meat cookery and presents basic information on the nutritive value of meat. If this section included more of the extensive data available on these subjects, it would increase the usefulness of the book to a less technical audience.

The historical references throughout the book give it a special charm lacking in most books of such a technical nature and made it interesting as well as informative reading.

This book would be of value to those in any phase of the meat industry. The food technologist, bacteriologist, and home economist who work with meat and meat foods should be acquainted with Dr. Jensen's book. The dietitian who endeavors to maintain an up-to-date food library should make *Meat and Meat Foods* part of it. It will be invaluable to her as a reference on the subject of this important food. In fact, she will no doubt find that the book and its extensive bibliography will answer the many questions she may have concerning meat, its processing and preservation.—*Rita Campbell, Assistant Director, Department of Nutrition, National Live Stock and Meat Board, Chicago.*

For your food file, Doctor—

information about canned green beans

Green Beans

Nutritive value in average* serving of canned green beans

Nutrient	Quantity	Percentage of Daily Recommended Allowance**	Percentage of Minimum Daily Requirement***
Food Energy (1)	21 calories	1	—
Protein (1)	1.2 gm.	2	—
Calcium (1)	36.7 mg.	4	5
Phosphorus (1)	22.7 mg.	—	3
Iron (1)	1.3 mg.	11	13
Vitamin A (2, 3)	320 I.U.	6	8
Thiamine (2, 4)	0.030 mg.	2	3
Riboflavin (5, 6)	0.039 mg.	2	2
Niacin (4, 6)	0.35 mg.	2	—
Vitamin C (2, 3)	3.0 mg.	4	10

*108 grams **Percentage based on Recommended Daily Allowance for physically active man—National Research Council. ***Percentage based on Minimum Daily Requirement for adult over 12 years of age—Food and Drug Administration.

1. Food Research *11*, 391 (1946)
2. J. Am. Dietet. Assoc. *23*, 226 (1947)
3. J. Nutrition *28*, 107 (1944)
4. J. Nutrition *28*, 117 (1944)
5. J. Nutrition *28*, 123 (1944)
6. J. Am. Dietet. Assoc. *21*, 357 (1945)

This information is presented so that your secretary may clip it for your abstract file. If you would like free reprints of other advertisements providing similar information on salmon, carrots and corn, write to:

General Research Laboratory, American Can Co.
Maywood, Illinois

The Seal of Acceptance denotes that this advertisement has been reviewed by the Council on Foods and Nutrition of the American Medical Association and has been accepted by them.

American Can Co., *New York • Chicago • San Francisco • Hamilton, Canada*

Current Literature

Contributed by Janette C. Carlsen and Ethel M. Miller, The Johns Hopkins Hospital, Baltimore; Hermia M. Handt, Veterans Administration Hospital, Hines, Illinois; Pauline Kegereis, The Children's Mercy Hospital, Kansas City, Missouri; Berdena Rosenow, University of Kansas Medical Center, Kansas City, Kansas; Mildred Bonnell and administrative interns, University of Washington, Seattle; and the Journal staff.

THE AMERICAN JOURNAL OF MEDICINE

Vol. 9, August, 1950

*The present status of potassium therapy. J. R. Elkinton and R. Tarail.—p. 200.

Potassium Therapy. Potassium deficiency is related to an obligatory and persistent excretion of potassium in the absence of intake of the ion, and under certain circumstances to the presence of bicarbonate excess or alkalosis. Such deficiency is found in starvation, dehydration, gastrointestinal disturbances, and diabetic acidosis. It may also be induced in Addison's disease by overtreatment with desoxycorticosterone and in other conditions by the administration of ACTH or cortisone. Specific signs and symptoms are usually not present. The diagnosis depends on recognition of etiologic circumstances and is aided by the finding of abnormally low concentrations of serum potassium. Dosage of administered potassium may range in the adult from 30 to 150 milliequivalents per day. The cardinal danger of potassium therapy is cardiac arrest due to elevation of the serum potassium concentration.

ENDOCRINOLOGY

Vol. 47, July, 1950

*An immediate response of the demedullated adrenal gland to stress. M. L. Gordon—p. 13.

*Production of reversible hyperadrenocortinism in rats by prolonged administration of cortisone. C. A. Winter, R. H. Silber, and H. C. Stoerk.—p. 60.

Adrenal and Stress. In controlled experiments, female rats were studied to determine whether the adrenal medulla is essential for pituitary activity following stress. Effects of cold, histamine, and insulin on adrenal ascorbic acid concentration and eosinophil count of adrenal-demedullated animals were studied. Ascorbic acid concentration of the regenerated, demedullated adrenal gland becomes constant thirty-two days after enucleation. Insulin, histamine, and cold produce a marked decrease in concentration of ascorbic acid in the demedullated adrenal gland in 1 hr. It is concluded that the adrenal medulla is not essential for activation of the pituitary gland by stressing agents.

Adrenals and Cortisone. Cortisone acetate was administered subcutaneously to male rats daily for six weeks. Growth ceased, and regrowth of hair denuded by plucking was suppressed. The adrenal glands atrophied over 50 per cent, and cholesterol and ascorbic acid concentrations in the adrenal glands were markedly reduced. The thymus gland became extremely atrophic, and the spleen was reduced in size. All changes proved reversible. No chronic effects were found upon liver fat, nitrogen, phosphorus, or glycogen, or upon kidney nitrogen, phosphorus, or glycogen.

GASTROENTEROLOGY

Vol. 15, August, 1950

*Psychosomatic relationships in the digestive system. J. A. Bargen—p. 581.

Changes in the gastroscopic appearance of the human stomach following intravenous tetraethyl ammonium chloride. A. H. Hendin, A. L. Hahn, and W. A. Knight—p. 667.

*The effect of banthine on gastric secretion in man and experimental animals. C. A. Smith, E. R. Woodward, C. W. Janes, and L. R. Dragstedt—p. 718.

*The effect of atropine on certain gastric functions in patients with duodenal ulcer. B. F. Gill and J. S. Jessup—p. 736.

Psychosomatic Relationships in Digestive System. The author discusses the relative importance and validity of the psychosomatic concept in regard to pathogenesis of disease of the eosphagus, stomach, liver, pancreas, and small and large intestines.

Effect of Banthine on Secretion. This article reports the effect of orally administered banthine, a quaternary ammonium compound, on gastric secretion in patients with peptic ulcer and in dogs with various types of gastric fistulae and isolated stomach pouches. There was marked reduction in secretion of gastric juice in dogs and in nocturnal gastric secretion of peptic ulcer patients.

Effect of Atropine. Six hospitalized male patients with uncomplicated duodenal ulcer were studied to determine the effects of atropine sulphate by mouth on certain functions of the stomach. Marked diminution in free and total acid production, rate of gastric secretion, and rate of pyloric evacuation was observed.

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Vol. 143, August 12, 1950

Diabetes mellitus in association with myasthenia gravis. S. M. Perry—p. 1332.

*Foods of animal origin. P. E. Howe—p. 1337.

Pregnancy in diabetes. Editorial—p. 1346.

Vol. 143, August 19, 1950

*Hypervitaminosis A. Editorial—p. 1417.

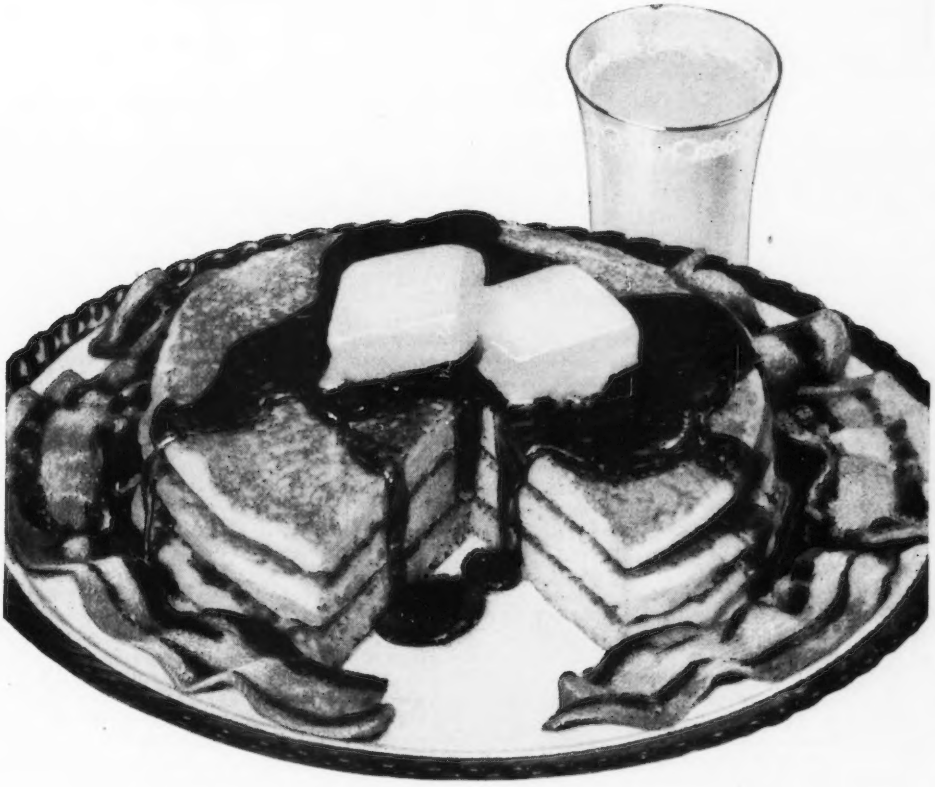
Foods of Animal Origin. This review contains information on the digestibility and availability of proteins and fats of animal origin. Animal foods which are also excellent sources of water-soluble vitamins and some of the minerals are considered.

Hypervitaminosis A. Storage of vitamin A and regulation of its blood level are functions of the liver. There is some evidence that hypervitaminosis A may be caused by hepatic dysfunction rather than by supersaturation of the liver with the vitamin.

JOURNAL OF THE INDIAN MEDICAL ASSOCIATION

Vol. 19, February, 1950

*Fats in nutrition—p. 194.



A Real American Breakfast

That a nutritious breakfast providing generous amounts of high quality protein prevents late morning hypoglycemia has been amply demonstrated. As shown by Thorn and co-workers,[1] and later confirmed by Orent-Keiles,[2] ". . . breakfast high in protein and low in fat and carbohydrate was followed by an improved sense of well-being and no symptoms of hypoglycemia."

Meat for breakfast—ham, sausage, bacon, breakfast steaks—is an appetizing means of increasing the protein content of the morning meal. Its biologically complete protein contains all essential amino acids, and serves well in complementing less complete proteins from other sources. Furthermore, muscle meat is an outstanding source of B complex vitamins and of iron.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

(1) Thorn, G.W.; Quinby, J.T., and Marshall, C., Jr., Ann. Int. Med. 18:913 (June) 1943.
(2) Orent-Keiles, E., and Hallman, L. F., Circular No. 827, United States Department of Agriculture, Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, Dec., 1949.

American Meat Institute
Main Office, Chicago . . . Members Throughout the United States

Fats in Nutrition. Topics discussed at a conference on "Triglyceride Fats in Human Nutrition" were the chemical constitution of natural fats, a study of fat absorption, types of defective fat absorption, and intravenous alimentation.

THE MILBANK MEMORIAL FUND QUARTERLY

Vol. 28, July, 1950

*A survey of nutritional status among school children and their response to nutrient therapy. J. H. Browe and H. B. Pierce.—p. 223.

*Changes in blood values during pregnancy and the relation of protein levels to toxemia symptoms. D. G. Wiehl.—p. 238.

Response to Nutrient Therapy. Twenty-four children with conjunctival changes, twenty-one children with gum changes, and nineteen children with tongue changes received therapeutic amounts of vitamin A, ascorbic acid, and niacin, respectively, for varying periods of time up to two years. In the vitamin A group, eleven had demonstrable improvement in the lesions; in the ascorbic acid group, seven improved; and in the niacin group, thirteen improved. In comparing these responses with the various control groups, it was found that these responses were statistically significant.

This study presents confirmatory evidence that the changes are the results of chronic deficiency in specific tissues. It also demonstrates that tissues reflecting deficiency states undergo recession and restoration upon provision of therapeutic amounts of the appropriate nutrients.

Changes in Blood Values During Pregnancy. Blood values for the volume of red blood cells (hematocrit), for hemoglobin, for total protein, and for albumin decreased markedly during the first half of pregnancy for a large group of women. In the second half, although plasma volume continued to increase, both the hematologic values and total protein and albumin values showed only a slight further decrease. Globulin increased during the second and third trimesters. These data indicate a greatly increased production of these blood constituents. The incidence of selected symptoms commonly associated with toxemia of pregnancy was found to be much higher among women having both total serum protein levels and serum albumin levels below the average values for the group at any period of pregnancy than among women with either total protein or albumin values at the average or higher level. Incidence was lowest if the albumin value remained at the average or higher level, but a globulin value high enough to maintain the total serum protein at the average or higher level despite a low albumin level afforded considerable protection against occurrence of these symptoms.

SCIENCE

Vol. 112, August 11, 1950

*Failure of vitamin B_{12} to promote growth of premature infants. D. F. Downing.—p. 181.

Failure of Vitamin B_{12} to Promote Growth of Premature Infants. With the development of knowledge of animal protein factors and vitamin B_{12} as growth-promoting factors for animals and bacteria, a study was undertaken to determine the effect of B_{12} on forty-eight infants. Twenty-five received vitamin B_{12} intramuscularly, and the others served as controls. There was no appreciable difference between those receiving vitamin B_{12} and those serving as controls. On all counts, there was a slight margin of superiority in the control infants. This indicates that a deficiency of this vitamin does not exist in premature infants.

THE SOUTHERN MEDICAL JOURNAL

Vol. 43, August, 1950

*Soya tecithin and alphatocopherol in diabetes mellitus: A preliminary report. H. W. Dietrich.—p. 743.

*Folic acid and pregnancy. Editorial. p. 746.

Soya Lecithin and Alphatocopherol in Diabetes. Therapeutic application of the various lipotropic factors such as choline, inositol, and lecithin has been repeatedly reported in the treatment of liver cirrhosis and liver insufficiency and also other diseases more or less related to faulty lipid metabolism. Evidence submitted of five cases of diabetes mellitus shows that when soya lecithin and tocopherol were administered orally, the insulin needs decreased.

Folic Acid and Pregnancy. The biotic antiseptics sometimes have a vitamin depleting effect since they may destroy bacteria in the intestines which commonly produce vitamins. Aminopterin induced a folic acid deficiency in rats with resulting anemia and other symptoms of folic acid deficiency. If aminopterin therapy was initiated at the time of implantation of the ova, normal fetal development did not occur. A depletion of the bone marrow resulted, the treated animals lost weight, and the embryos were irreversibly damaged. Careful study is essential for the discriminating use of all the new pharmaceuticals.

AMERICAN RESTAURANT MAGAZINE

Vol. 34, August, 1950

*What's your reputation on vegetables. J. A. Cline.—p. 41.
Manpower development.—p. 74.

Serving Better Vegetables. The essential points on fresh vegetable buying, storing, and cooking are covered. Some of the points discussed are: changes in quality caused by "ripening" after gathering, factors affecting quality and quantity, methods of preserving quality by proper storage, suggestions for serving vegetables uncooked, and methods of cooking vegetables to improve or at least not injure the appearance, texture, flavor, and nutritive value.

COLLEGE AND UNIVERSITY BUSINESS

Vol. 9, August, 1950

*Prize kitchen. L. W. Scott.—p. 46.

College Cafeteria. A diagram and description is given of a newly installed and equipped cafeteria at Michigan State College, East Lansing. The number of meals per month reach 80,000 plus those for banquet service and student grill making a total of 200,000 per month. All cooking is electric and equipment is supplied with automatic and thermostatic controls for pressure and temperature. The staggering of the cooking of vegetables is recognized as essential with the installation of 3-, 5-, 10-, and 40-gal. steam jacketed kettles. A central dishwashing machine incorporates four sections for silver, glassware, china, and trays. Dish driers are attached to the machine to eliminate the unnecessary use of manpower.

HOSPITALS

Vol. 24, August, 1950

*Kitchen to patient—a straight line is the shortest distance. M. W. Northrop.—p. 95.

Straight Line from Kitchen to Patient. Floor plans, before and after the advice of the dietitian was obtained, and basic flow charts, are used to illustrate that the hospital administrator, architect, and dietitian must work together to effect efficiency of operation and economy. By omitting 120 ft. of partition, five sinks, two ranges, one mixer, three

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urns, one potato bin, one refrigerator, one proof box, two sterilizers, two tables, and 12 ft. of counter, the dietitian was not only able to improve the efficiency of the proposed kitchen, but effect a great saving in equipment. Comments are included concerning the importance of storeroom planning, straight-line cooking to serving, operations analysis, and scheduling staff work. Information concerning routing and working clearances is also given.

INSTITUTIONS MAGAZINE

Vol. 27, August, 1950

*Use cost control principles to curb prices and payroll. J. W. Stokes.—p. 1.
*How to scrutinize food purchasing, receiving, storage.—p. 2.
Good light, ventilation basic for proper sanitation practice.—p. 3.
Lighting adapts atmosphere to mood of meals.—p. 4.
*Let's take a look at your kitchen cutlery.—p. 40.
*Salesman-dietitian problems clarified in annual powwow.—p. 54.
Straight-line techniques cut operating costs.—p. 93.

Techniques of Cost Control. Restaurants, schools, hospitals, and other institutions are facing an increasing problem of inflation. High food prices and increased labor costs are reflected in the costs of equipment, supplies, transportation, utilities, and taxes. To control costs, an operating manual is outlined which calls for a budget, accounting, and organization—including menu making, purchasing, receiving, storage, food preparation, cooking, portioning and serving, employees' meals, and accounting for cash. Accounting includes food costs, monthly statements, daily cost control, types of forms, and records of food issued from the kitchen. Control of labor costs includes not only wages, but employees' meals, vacation pay, overtime, and employee benefits. Job analysis is profitable for most institutions and has resulted in installing labor-saving machinery, combining services, and re-locating equipment to save steps.

Savings in Food Purchasing, Receiving, and Storage. An accountant offers suggestions to save money on purchasing, receiving, and storing in mass feeding operations. This practice may overload the storeroom, thus creating larger inventory and requiring higher labor cost; cause increases in shrinkage, trim, and spoilage; and provoke easy pilferage. The sensible amount of inventory depends upon local market conditions, proximity to available markets, and sales volume. The inventory should turn over four times a month. Reduction of inventory can be accomplished by purchasing meats and produce for daily menus and purchasing other items for use within a reasonable period of time. To do this, the food manager must concentrate on the operation of the food department, rather than on market speculation. Specification buying helps get your dollar's worth. The lowest price quotation is not necessarily the most economical, since there may be less waste in more expensive purchases. Weight specifications on meat should be established for individual items. The receiving clerk should be informed of purchases and given instructions as to what to do when deliveries are made. He needs the proper scales to check weights. The storekeeper should keep spoilage requisitions to check both on care given deliveries and over-buying. Requisitions enable daily food cost accounting. If the storekeeper marks the price on each unit instead of on a set of price cards, his job will not take too long. How much storeroom control the small operator needs depends upon his volume of business.

Importance of Cutlery. Although the investment in cutlery in institution kitchens is small, the possible saving by efficient work with proper tools used correctly and well-cared for is important. The ordinary kitchen helper must be taught to appreciate and use cutlery skillfully. If poor working habits continue, expenses will increase because of replacement cost. Good quality professional cutlery in sufficient quantity should be provided. Management should make provision for proper care of the cutlery by providing safe, convenient, orderly slotted racks. The reputation of the manufacturer is the best assurance that the cutlery has adequate carbon content and has been properly tempered. The quantity of cutlery depends upon the variety of jobs to be done and the number of employees likely to use the same kind of cutlery at the same time. Training employees to use and care for cutlery may be done by the supervisor or by one or two persons in each department who have demonstrated that they know the proper use and care.

Improving Relations Between Salesmen and Dietitians. At the 29th convention of the Ohio Dietetic Association, John T. Lynch suggested how better relations could be achieved between dietitians and salesmen. His recommendations were compiled from answers to a questionnaire circulated among dietitians and salesmen. In analyzing results, he characterized salesmen and dietitians in the following categories: "Thoughtless Tom" always comes at an inconvenient hour, expects everything to be dropped as soon as he arrives, stays too long, and never says "thanks." "Elusive Elaine" doesn't remember appointments, runs out on errands while the salesman is present, and doesn't give her undivided attention. "Garrulous Gus" indulges in too much small talk. "Erudite Edith" delights in showing off her scientific knowledge. "Personality Pete" thinks his good looks offset ignorance about his products. "Bargain Hunting Betty" always finds the price "too high." "The big 'I' with the 'In'" high-pressures the dietitian by bluffing and insinuating he knows the board members. Mr. Lynch concluded that three suggestions could improve relations: that the salesman be properly selected, trained, equipped, and motivated; that he strive to achieve a professional level of selling which makes him a consultant and assistant purchasing agent; and that the dietitian give him an adequate hearing and sufficient information so that he can interpret his products in terms of the dietitian's particular needs and budget.

QUICK FROZEN FOODS

Vol. 18, August, 1950

*Food freezing.—p. 50.

New Frozen Fruit Pie Mixes. Introduced in this article is a new method for preparing uncooked frozen fruit pie mix. These pies have a superior quality to pies baked from regular frozen fruits.

RESTAURANT MANAGEMENT

Vol. 67, August, 1950

*How a group of volunteers served 10,000 meals in 38 minutes. A. Easton—p. 40.
Your menus are your best salesmen. P. Heine—p. 42.

Ten Thousand Meals in 38 Min. The Boston Jubilee Baked Bean Supper took place last May at the Boston Common, where 10,000 people sat down at long tables and were served a complete meal in 38 min. The pattern laid out for serving the food is one that can be followed in any community where it is necessary to feed a large number of people in a limited time. Four factors influence success: (a) careful selection of personnel; (b) thorough planning of the work, even to the smallest detail; (c) specified timing of deliveries of food and supplies; (d) good team work between the women on the serving committee and the men who procured and delivered the food. A planning committee of seven was selected from the various local fields of food service. The group was thought of not as 10,000 individuals but as 20 units of 500 persons each. A captain was in charge of each serving unit. All the food except the beans was wrapped, to insure sanitation. A detailed list of instructions was sent to each member of the serving units.

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or too OLD

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Extra-lean meats for geriatric patients, Gerber's Beef and Veal (less than 3% fat), Liver (5.4% fat). All prepared from selected Armour cuts. They provide True-Meat flavor *and* color to encourage the consumption of high quality protein—important at all age levels.

Extra economical for those older patients on limited incomes. Gerber's ready-to-serve Meats cost less than if prepared at home. So do most of Gerber's Fruits, Vegetables, Desserts. And their Perfected-Texture meets the dental and digestive needs of old age.

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MALTEX points the way to a GOOD BREAKFAST

The need for nourishing breakfasts is common to all ages. Maltex Cereal, enjoyed by young and old alike, is an ideal hot cereal on which to base a nutrition-right breakfast. Maltex is Toasted Wheat and Malted Barley in delicious, nutritious combination, rich and nut-like in flavor, temptingly, naturally sweet. And Maltex is very easy to digest.

Maltex Cookies are delicious—amazingly inexpensive and easy to make

MALTEX COOKIES

½ cup shortening
1 egg
½ cup molasses
½ cup Maltex Cereal, uncooked
½ cup sugar
1½ cups flour
1 teaspoon soda
½ teaspoon salt
2 level teaspoons ginger

Cream shortening, add beaten egg, molasses, Maltex Cereal and sugar. Beat well and add flour, soda, salt and ginger sifted together. Mix thoroughly and drop from a teaspoon on greased cookie sheets. Press round and thin, using the bottom of a tumbler, wrapped in a damp cloth. Bake in oven 350° for 8 to 10 minutes. Makes 6 dozen three-inch cookies.

Helpful Free Material

Daily Diet Record—Colorful plan sheet giving Basic Seven Food items.
Recipes for Serving 100 People—Four-color booklet of nourishing and taste tempting recipes.
Be Dietwise—A practical and scientific guide to reducing.

Home Economics Department
MALTEX COMPANY
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News Notes

A.D.A. Officers and Committees for 1950–51. The following officers took over their duties for 1950–51 following the A.D.A. Annual Banquet at the Hotel Statler, Washington, D.C., on October 20:

President, Lillian Storms Coover, Ph.D., Ames, Iowa.
President-Elect, Margaret A. Ohlson, Ph.D., Michigan State College, East Lansing
Secretary, Marguerite L. Pettee, The Colorado Medical Center, Denver
Treasurer, Winifred Howard Erickson, Ancker Hospital, St. Paul.
Speaker of the House of Delegates—Helen S. Mitchell, Ph.D., University of Massachusetts, Amherst
Speaker-Elect of the House of Delegates—Helen L. Gillum, Ph.D., University of California, Berkeley

The following members of the Association were also elected to office for the coming year:

Delegates at Large:
Helen E. Walsh, California State Department of Public Health, San Francisco
A. June Bricker, Metropolitan Life Insurance Company, New York City
Mary M. Harrington, The Harper Hospital, Detroit
E. Evelyn Smith, University of Illinois, Urbana
Clara Childress, Veterans Administration Central Office, Washington, D. C.—Senior Delegate
Frances Welch, School Lunchroom System, Dallas—Senior Delegate

Nominating Committee:
Chairman: Marjorie Hall Siler, Margaret F. Ross, Memorial Hospital, Charlotte, North Carolina
Mary C. Barnes, Oklahoma A. & M. College, Stillwater
Margaret Ritchie, University of Idaho, Moscow
Effie May Winger, New England Deaconess Hospital, Boston

Section Chairmen for 1950–51 will be:
Community Nutrition Section: Mary Reeves, U. S. Social SecurityBoard, Chicago
Diet Therapy Section: Corinne Robinson, Lansdowne, Pennsylvania
Food Administration Section: Marion Floyd, U. S. Public Health Service, Washington, D. C.
Professional Education Section: Alice Biester, University of Minnesota, St. Paul

Army Recalls Reserve Dietitians to Duty. The Women's Medical Specialist Corps Reserve will order to active duty before November 29 seventy reserve dietitian officers in the grade of lieutenant and captain. Quotas for dietitians, allocated according to Army Areas, are:

First Army	18
Second Army	12
Third Army	5
Fourth Army	5
Fifth Army	18
Sixth Army	12

Reserve officers who will be deferred are those in key administrative and teaching positions in hospitals and other institutions conducting training courses for dietitians, reservists whose absence might endanger the health of the community, and full-time university or college students, who may complete the current academic year.

Selections will be made first from among reservists who have had no previous military service or from those with the shortest tours of duty. Those with dependents under eighteen years of age are not eligible for active duty.

Government Vocational Guidance Booklet on Dietetics. *The Outlook for Women in Dietetics* is the title of the new publication of the Women's Bureau, U.S. Department of Labor. It is the first in a series on home economics careers planned by the Bureau, and as such carries the number "Bulletin No. 234-1."

In it, both the outlook for dietitians and that for public health nutritionists are considered. In each case, the following topics are covered: demand, supply, training, earnings, working conditions and advancement, organizations, and suggestions to those entering the field. Extensive detailed information on entrance requirements for: federal civil service in dietetics, dietetic internships, the American Dietetic Association, and public health nutritionist are included in the appendix. Ninety bibliographical references provide sources for further study. A number of illustrations are included to show hospital dietitians and public health nutritionists at work.

Copies of this eighty-page booklet may be obtained from the Superintendent of Documents, Washington 25, D.C., for 25 cents a copy.

Model Health Center to be Opened in Philippines. A rural Health Demonstration Center will open shortly in the Philippines as a joint effort of the Philippines Government, the United Nations International Children's Emergency Fund, and the World Health Organization. The Center will place special emphasis on maternal and child hygiene and will be used for training medical and health personnel in different categories.

Let genuine JELL-O DESSERTS help cut your food costs!

COFFEE CREAM PUFFS

Make deliciously different cream puff filling. Mix ½ cup Instant Maxwell House Coffee powder with 1½lbs. Jell-O Vanilla Pudding powder. Cook as usual, cool. Whip 2 cups heavy cream and fold in pudding. Fill puffs. Top with coffee-flavored glaze. Attractive and delicious at only about . . .

5¢ A SERVING!

JELL-O APRICOT PIE

New, delicious, and easy to make with full-flavored Jell-O and puréed dried apricots. For 4 pies, dissolve 12 oz. Orange Jell-O and 1 lb. 5 oz. sugar in 2 qts. hot water and apricot juice. Add 1¼ qts. puréed apricots. Chill till thick; fill pie shells; chill till firm. To garnish, use whipped cream. A bright tasty treat for only about . . .

4½¢ A SERVING!

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Tart and tangy Jell-O Lemon Pie Filling becomes a luscious dessert just by folding in whipped cream (or whipped evaporated milk). Use sprig of mint for garnish. A customer-winner for only about . . .

3½¢ A SERVING!

More and more restaurant managers are finding that it pays to serve genuine Jell-O desserts.

Jell-O and Jell-O Puddings are national family favorites . . . have been for years and years. And these popular desserts offer you a splendid way to whittle down your food bill.

There are literally hundreds of variations you can serve for as little as 1½ to 5¢ a serving. When many desserts costs twice as much, or more, and when you consider that desserts account for up to 20% of your total food costs, you'll see what a saving these favorites represent.

Be sure to use genuine Jell-O flavored gelatin . . . Jell-O Puddings . . . and Jell-O Lemon Pie Filling, the kind your customers know and like best.

Any slight increase in initial cost is outweighed by your gain in customer acceptance—quality—and volume of business.

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FREE OFFER

You'll find a wonderful variety of delicious quality desserts in the new *GF Album of Desserts*. For your free copy, write to General Foods Corporation, Institution Food Service, 250 Park Avenue, New York 17, New York.

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The program will be concerned with the control of communicable diseases, the prevention of malaria, tuberculosis control, nutrition, sanitation, vital statistics, health education, nursing, and other essential activities. The Center will be placed in a typical rural district within reach of Manila to provide for practical instruction of health workers and students from both the capital and the provinces.

Dietetic Interns Graduate. Recent graduates at *Beth Israel Hospital*, Boston, were: Althea Benedict, University of Nevada; Leah Clayman and Alma Harris, Framingham State Teachers College; Jean Higgins, University of New Hampshire; Barbara Kenny, Mount Saint Mary College; Pearl Lindsay, College of Saint Teresa; Hilda McLaughlin and Clare Williams, Acadia University; Rhoda Paletz, University of North Dakota; and Mary Jane Robinson, Ohio State University.

Dietetic interns who recently completed internships at the *Boston Dispensary* were Marie Theresa Brunelle, University of Montreal, and Eleanore Ridge, New York University.

Graduation exercises for dietetic interns at *Freedmen's Hospital* School of Dietetics, Washington, D. C., were held on September 21. Eleanor M. Sprague, Dietetic Branch, Division of Hospitals, U.S. Public Health Service, gave the commencement address. The following interns were in the class: Lucy Sessoms and Gloria Edwards, North Carolina College for Negroes: Derieth McCurry, Kansas State College; Evelyn Ore and Doris D. Taylor. Howard University; Ruby Stephens, University of Colorado; and Ethel Wingo, North Carolina Agriculture and Technical College.

About 150 people attended the graduation of twelve dietetic interns at *Kennedy Veterans Administration* Hospital, Memphis, on September 14. Rosemary Lodde, Educational Consultant of the Dietetic Division, Veterans Administration, Washington, D. C., spoke on, "Let's Look at Our Profession." Graduates were: Janice C. Arundel, Judith C. Bowman, Doris I. Chivers, Jean Cooley, Macarita O. Coronado, Bernice M. Hooker, Nellie M. Jackson, Ann E. Moss, Eleanor D. Nesbit, Helen Snyder, Martha E. White, and Virginia L. Wolfe.

This year's graduates from *Massachusetts General Hospital*, Boston, were: Margaret A. Burkhart, University of Tennessee; Ruth J. Aaness and Virginia R. Whitlatch, University of Wisconsin; Virginia A. Ahrens, University of Denver; May M. Inouye, University of Hawaii; Patricia A. Lawson, University of Delaware; Lillian R. Parker, Women's College, University of North Carolina; Jane E. Patrick, Lake Erie College; Lois C. Swanson, University of Minnesota; Mary E. Barrett, University of Connecticut; Marilyn J. Bashore, University of Maryland; Nancy Colburn, Simmons College; Betty L. Davis, Washington State College; Marjorie E. Dunn and Marion D. Field, Iowa State College; Margery G. Gourlay, Macdonald College, McGill University; Elaine Lagos, Utah State Agricultural College; Pauline R. Olsen, Framingham State Teachers College; Betty L. Rankin, University of Idaho; Jeanette Seeley, University of Washington; Athena Voudouris, Massachusetts State Teachers College; and Martha J. Wood, Purdue University.

At *Mt. Auburn Hospital*, Cambridge, Massachusetts, four dietetic interns have recently completed their training: Helen F. Bride, University of Massachusetts; Irene M. Marotte, Framingham State Teachers College; M. Patricia O'Connor, Regis College; and Lucille M. Wakefield, University of Connecticut.

Dietetic interns who completed their training this year at *Peter Bent Brigham Hospital, Boston*, are: Gwendolyn E. Krahnke, University of North Carolina, Alida Fremont Morse, San Jose State College; Clotilda Ann Riani, Framingham State Teachers College; Lourdes Raymundo Marquez, University of Philippines; and Nancy Elizabeth Newcomb, Ohio Wesleyan University.

Questions Needed for Nutritionist Examinations. The Merit System Service of the American Public Health Association is asking A.D.A. members to contribute questions for examinations in public health nutrition and dietetics. The Service prepares examinations for state and local public health areas.

A reservoir of examination questions

You can get up to 12 slices per minute, 720 per hour from a Savory Toaster that requires only 23⅜ inches x 16⅝ inches of counter space. There are smaller sizes for smaller needs, but regardless of size you'll get more toast in less counter space with a Savory Toaster.

Savory Toasters are unusually economical to operate. Only 2,000-2,600 watts per hour will operate Model CT-2, the 6-slice-per-minute all-electric unit. Gas operated models with capacities of 6 to 12 slices per minute operate on LP, Natural or Manufactured Gas for as little as ¾¢ per hour in full operation.

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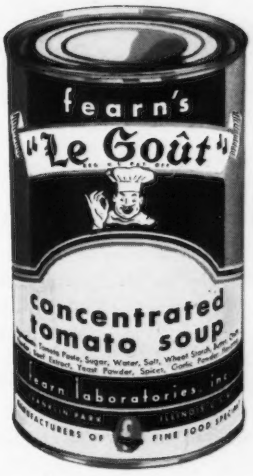
It's simply delicious...it's Le Goût, the Tomato Soup of Distinction!



A single taste tells guests that here is something special . . . something unusually fine! It's lively, rich, full-flavored. No wonder this delicious Le Gout Tomato Soup is being served in more and more fine dining rooms every day. It has been specifically developed for restaurants, hotels and clubs by a company long experienced in providing fine specialties for establishments of excellent reputation. This means that Le Gout Tomato Soup is always uniform . . . has a distinctively delightful flavor . . . is extremely easy to prepare. Unit cost is modest—2¾c per 6-ounce serving. And you can use it for both Regular or Cream of Tomato Soup. Ask the Le Gout man or your jobber for a demonstration.

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is to be developed from questions prepared by professional personnel in public health nutrition, and reviewed by public health nutritionists. A consultant on the subject-matter and psychometricians of the regular staff will scrutinize and edit the final questions.

Questions in the following fields are especially needed: nutrition education, nutrition requirements, nutrition measurements, nutrition programs, budgeting, cost accounting, equipment, and public health problems in nutrition programs. Each acceptable item is paid for at the rate of 75 cents to $1.25. Instructions for preparing questions are available from Catherine Leamy, Merit System Service, American Public Health Association, 1790 Broadway, New York 19.

Conventions. *The Association of Military Surgeons* will hold its annual convention November 9 to 11 at Hotel Statler, New York City. All dietitians are invited to the program, which includes a panel of papers to be given by Women's Medical Specialist Corps Reserve Officers. Colonel Emma E. Vozel, Chief of the WMSC, is Chairman of the Association's WMSC Section.

The third annual scientific meeting of the *Gerontological Society, Inc.*, will be held November 12 and 13 in St. Louis. Included on the program will be a paper by Clive M. McCay, Gladys Sperling, F. E. Lovelace, L. L. Barnes, and Clifton A. H. Smith, Cornell University, on "The Effect of Ingestion of Large Amounts of Water and Milk upon the Life Span of Albino Rats."

List of Health Films Published. "Recent Health Films," a seventy-three-page catalog compiled by Emily S. Jones, includes information of films on nutrition and sanitation. Other films listed in areas of interest to dietitians are on child care and development, general health, public health, and world health. The publication is available for a $1.00 from the Educational Film Library Association, Inc., 1600 Broadway, New York 19.

New Films. The Film Division of the United Nations has prepared fifteen 35-mm., single-frame documentary film strips describing different phases of the United Nations activities. They are available for showing at group meetings where no admission is to be charged. Further information can be obtained from the UN Film Division, Room K-201, Lake Success, New York.

Food and Nutrition Research Survey Published. An expanded second edition of "Nutrition Research in the United States" has been prepared by the Food and Nutrition Board of the National Research Council. The 300-page book covers 4500 current projects, identified by title, field of research, and sponsoring organization. Supervisory personnel and subject matter are also indexed. The new edition contains 500 more projects than the first edition issued in 1948, and the format now gives complete information on each project in one entry. Projects are classified under the following field and groups: Physiology, Chemistry, Technology, and Microbiology. This report is available from the Superintendent of Documents, Washington 25, D.C., for $1.75.

QM Food and Container Institute. An announcement has been made of the resignation of George Gelman, for four and a half years Technical Director of the Quartermaster Food and Container Institute, Chicago. Mr. Gelman resigned to go into private business.

Mary E. Keown. The A.D.A. Office has been notified of the death of Mary E. Keown on August 11, 1950. Miss Keown had been an A.D.A. member since 1936, and prior to her death had been employed as State Agent with the Office of Home Demonstration Work, Tallahassee, Florida.

Plentiful Foods. The U.S.D.A. expects the following foods to be in plentiful supply during November:

Fresh fruits and vegetables

Apples	Cranberries
Cabbage	Onions
Carrots	Potatoes, Irish
	Potatoes, sweet

Gelatine in Diets for Older Patients

The tired digestive system, whether or not restricted to an invalid's diet, requires meals that are bland, easily digestible, appetizing and nourishing.

For these patients doctors often prescribe frequent dishes made with Knox Unflavored Gelatine. With Knox it is possible to make an endless variety of salads, main dishes and desserts that fulfill all these requirements.

Unlike factory-flavored gelatin dessert powders with their high sugar and acid content, Knox is all protein, with no sugar content. Doctors recognize the supplementary protein advantages of Knox Gelatine.

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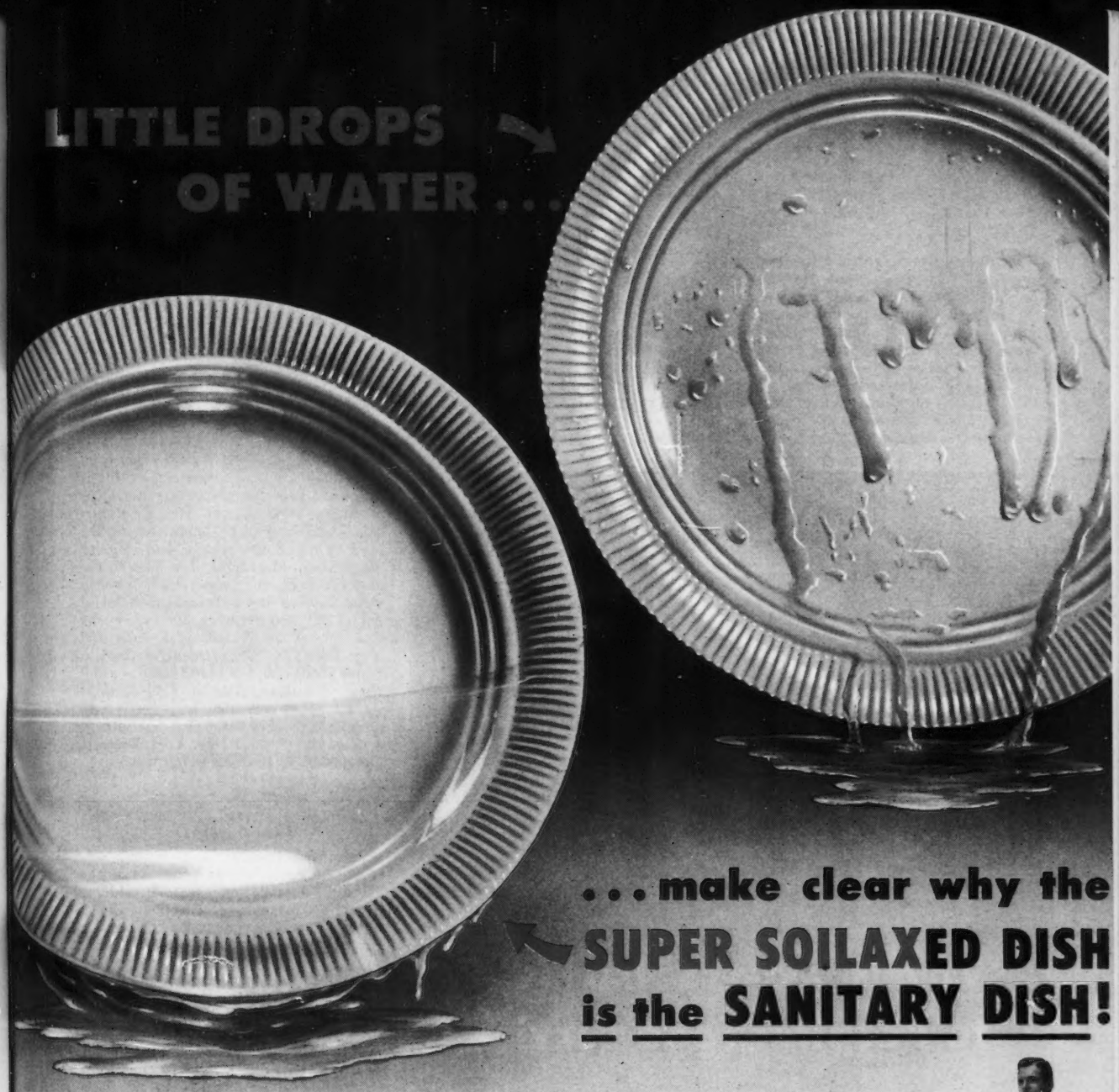

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EVERYONE who has ever washed dishes knows how flowing water can betray the presence of invisible grease or film on tableware. For where there's even the tiniest such obstruction to disturb the flow, some water lags behind in rivulets and drops, as seen at right above, and later leaves unsightly streaks and spots.

When you use Super Soilax in your dishwashing operations, the picture changes, as at left above. Water runs off in smooth "sheets" that *prove* no film, no grease, no single jot of foreign matter remains—that the surface is *really* sanitary clean!

Tableware comes gleaming from the machine in which Super Soilax is used—for Super Soilax prevents precipitation of film-forming elements that cloud glasses, film china, dull silver! Super Soilaxed, your tableware is a constant reminder to your guests of the care you take for their health and peace-of-mind—a constant advertisement of the superior quality of your entire service.

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Also manufacturers of* TETROX *for manual dishwashing, and* PAN DANDY*—new, activated pot and pan washing compound.

BY EVERY TEST—IT'S SUPER SOILAX FOR SUPER SANITATION!

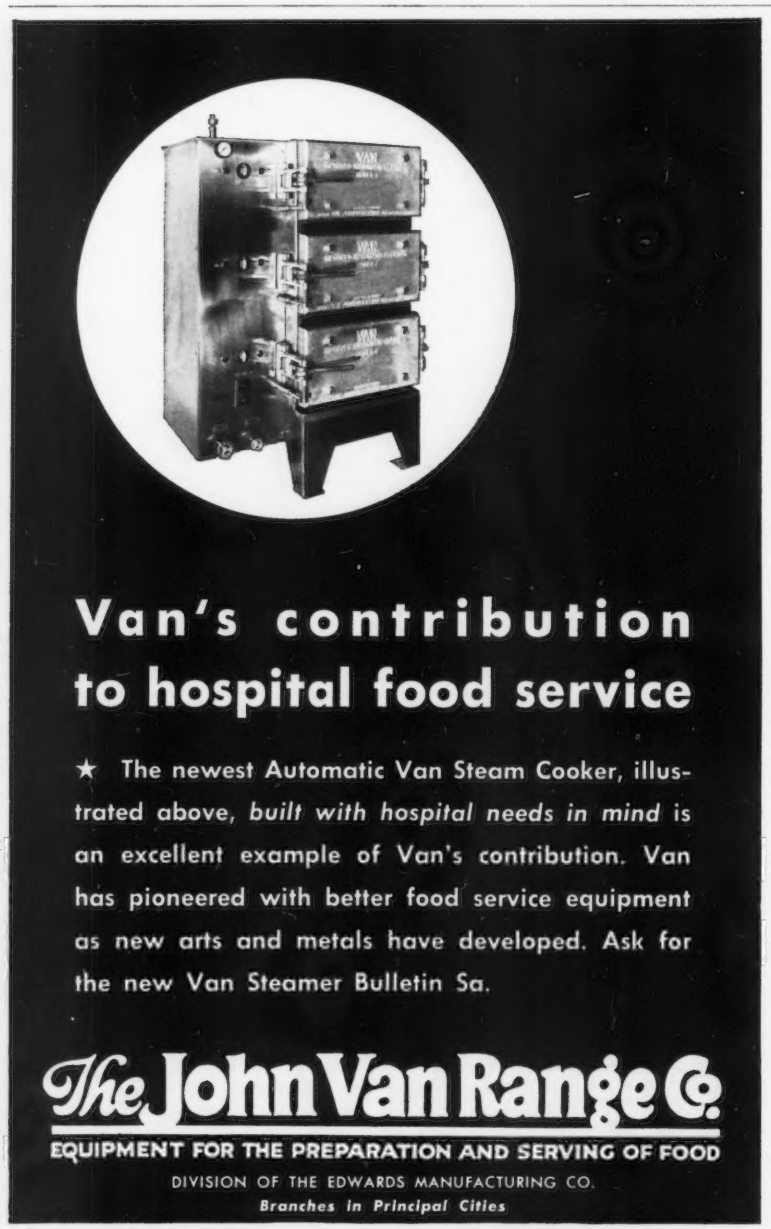
Other foods	
Beans, dried	Eggs
Butter	Fish
Cheese	Honey
Chickens—broilers and hens	Pork
Cottage cheese	Turkeys

Attitudes Concerning Restaurant Service. "The Restaurant Business—As the Public Sees It . . . As Proprietors See It" is a report in booklet form of a survey of both the public and restaurateurs to learn attitudes toward restaurant service. The survey was conducted by Opinion Research Corporation, Princeton, New Jersey, for General Foods Corporation and the National Restaurant Association. This report can be used by food service operators to check their operations, for it contains the points the public likes about restaurants as well as their criticisms. It can also be useful in planning advertising. Copies are available from the National Restaurant Association, 8 South Michigan Avenue, Chicago 3.

Tea Consumption. Imports and use of tea have been climbing steadily since World War II, according to the U.S.D.A. This country imported 104½ million lb. during the year ending July, 1950, an increase of 17 per cent over the previous year, and enough to make at least 20 billion, 900 million cups. This was higher than the previous record import of 1941—102 million lb. However, due to the population increase, the average consumption per person was only about 2/3 lb. a year, compared to 4/5 lb. in 1941.

Black tea produced by a fermentation process is preferred in this country, and the great bulk of it comes from India, Ceylon, and Indonesia. A shift from green to black tea began when, at the Chicago World's Fair of 1893, India and Ceylon introduced their black teas. Before that, U.S. tea drinkers had used green tea almost exclusively. Nevertheless, before the last war, as much as 20 per cent of the total tea used still was green. Rural districts in the West particularly preferred it.

Marion King Meter. The A.D.A. office has received word of the death on September 30 of Marion King Meter, Assistant Executive Secretary and Nutritionist, Washington Heights-Riverside District Health Committee of the New York Tuberculosis and Health Association. Mrs. Meter had been in the dietetic field for more than twenty years, having first become a member of A.D.A. in 1927. During her career she had served as Nutritionist with the New York City Department of Health, Foods Editor of *Forecast Magazine*, and Head Dietitian, Battle Creek Sanitarium. She had also been active in professional work, and was Vice-President of the Greater New York Dietetic Association at the time of her death.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News of State Associations

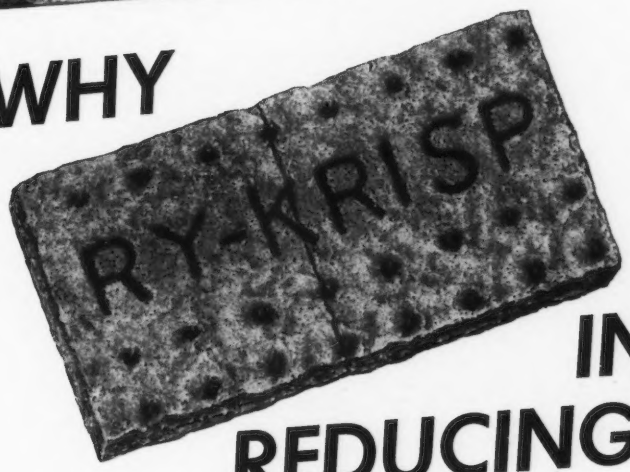
Arkansas Dietetic Association. Officers for 1950–51 for the Arkansas Dietetic Association are: President, Geraldine Waggoner; President-Elect, Christina D. Spear; Secretary, Margaret I. Leahy, and Treasurer, Olive H. Bost.

Illinois Dietetic Association. The Community Nutrition Committee of the Illinois Dietetic Association is planning a state-wide speakers' bureau to spread knowledge of good nutrition. Names of dietitians who are willing to speak occasionally will be offered to women's organizations, civic groups, and the chambers of commerce.

On September 20, the Executive Board of the Illinois Dietetic Association entertained the Executive Board of the Chicago Dietetic Association and the members of the A.D.A. headquarters staff at a get-together dinner, prior to the regular monthly meeting of the Chicago Dietetic Association. Speaker for the meeting was Dr. Earl H. Blair, Evangelical Hospital. Dr. Blair is a member of the medical committee for Chicago which is planning defense measures in the event of atom bomb attack, and he discussed the overall defense plan for the city.

Kansas Dietetic Association. The officers of the *Greater Kansas City Dietetic Association* for 1950–51 are: President, Monica Farrell, General Hospital; Vice-President, Conie Foote, Marketing Extension Service; Secretary, Evelyn Carter, Kansas City Dairy Council; and

WHY



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FREE Diet Booklets

Nutritionally sound, easy-to-follow guides to safe reducing and establishment of wise eating habits. Based on sound principles of reducing accepted by the Council on Foods and Nutrition of the American Medical Association.

"DESIGN FOR REDUCING" — 1200 calories for women; 1800 calories for men. Gives wide food choice, menus, recipes.

"THROUGH THE LOOKING GLASS" — 1500 calories. Especially written for teen-age girls. Gives recipes, menus, special tips.

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Treasurer, Eva Mae Stowell, Homemaker.

The *Topeka Dietetic Association* has elected the following officers for the coming year: President, Grace Scholz, Winter Veterans Administration Hospital, and Secretary-Treasurer, Dolores Tiemann.

The following officers for this year were elected by the *Wichita Dietetic Association* in May: President, Sister Mary Susanna, Pratt County Hospital; Vice-President, Marie Lies, St. Joseph's Hospital; and Secretary-Treasurer, Audris Rife, Wesley Hospital.

Massachusetts Dietetic Association. "Toward Professional Growth" is the theme of the Massachusetts Dietetic Association's 1950–51 program. The Mid-Century White House Conference on Children and Youth was the topic of the meeting on October 3, given by Thomas R. Flynn, Executive Secretary, Massachusetts Committee, Mid-Century White House Conference.

Two speakers will be featured at the November meeting at Mount Auburn Hospital, Cambridge. Dr. Charles R. Joy, national representative of CARE, will speak on "Our Part in Today's Situation." Dorothea Nicoll, Supervisor of Nutrition, Massachusetts Department of Public Health, will report on the A.D.A. convention.

A joint meeting of the Massachusetts Public Health Association, Social Welfare and Public Health Section of Eastern Massachusetts Home Economics Association, and the Massachusetts Dietetic Association will be held in December. The program will be a round table on "Solving Our Problems Through the Team Approach."

Joint meetings are planned for February, March, and April. In February, the dietitians will meet with the Massachusetts Home Economics Association to discuss vocational guidance. In March they will meet at the time of the New England Hospital Assembly, for which an address by W. L. Wilson, Administrator, Mary Hitchcock Memorial Hospital, Hanover, New Hampshire, is scheduled. In April, the joint meeting will be with the Worcester County Home Economics Association.

Officers for 1950–51 for the Massachusetts Association are: President, Lillian Myers Reiner, Beth Israel Hospital, Boston; Vice-President, Geneva Marble, Boston Lying-In Hospital; Secretary, Ruth C. Cottrell, Peter Bent Brigham Hospital, Boston; and Treasurer, Grace M. Covey, Veterans Administration Area Office, Boston.

New York State Dietetic Association. The *Rochester Dietetic Association* each year, in conjunction with the local medical group, works on a program or project of community interest. Last year's project, at the suggestion of a member of the medical society, was to work with the Monroe County Department of Social Welfare in developing a more uniform dietetic procedure in the area nursing homes. The dietitains worked with the medical society, the Department of Social Welfare, and the Visiting Nurse Association. A series of four lectures was presented bimonthly to the nursing home supervisors, the group consisting of registered nurses, business men, and practical nurses. Cooks of the nursing homes also attended. Each lecture followed the pattern of a physician discussing pertinent theoretical, physiologic, and medical information, after which a dietitian presented diets used for the conditions discussed. Normal nutrition was selected as the topic of the first lecture, in view of the preponderance of aged patients in the nursing homes. The second lecture dealt with diabetes and planning diets for diabetic patients. At the third meeting the subject of low-sodium diets was discussed, and menu planning and food purchasing were covered at the last meeting. The attendance at these meetings varied from thirty-five to forty people, out of a potential group of seventy. A follow-up inquiry four months later showed that the majority of the nursing homes were using the diets given at these meetings and that food standards had been improved. Section Chairmen for 1950–51 of the Rochester Association are: Community Nutrition, Elizabeth Henry, Visiting Nurse Association; Diet Therapy, Sadie Lipman; Food Administration, Gwendolyn Taylor; and Professional Education, Ethel Marth, American Red Cross.

Pennsylvania Dietetic Association. The Pennsylvania Association has announced the formation of a new regional group at State College, called the *Nittany Valley Association*. This is the seventh local group in the state.

The *Lehigh Valley Association* is again offering a prize to the high school student with the highest average in dietetics as a part of its vocational guidance program.

The *Philadelphia Dietetic Association's* first fall meeting in September was held at Friends' Hospital. Dr. Theodore L. Dehne, Superintendent, spoke on "Nutrition and Emotions." Agnes Lightwood, horticulturist, followed with a talk on "Flower Arrangements" and an outline of her work with patients at Friends'. On October 8 a joint meeting with the Philadelphia Home Economics Association and the Home Economists in Business was held at the Philadelphia Electric Company. The program was a demonstration of equipment and food preparation. Programs for other meetings of this year have been planned to include topics of interest to other allied groups, and guests at various meetings will include dietetic interns, public health and visiting nurses, school dietitians and nutritionists, home economics students, medical students, and directors of training schools. During the year two open forums with the Philadelphia Metabolic Association will be held.

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*Blickman-Built food service installations consistently win first awards: 2 First Awards in 1950, a First Award in 1949, a First Award in 1948 . . . in addition to numerous Merit and Honor Awards.

● *"The finest and most modern equipment"*—that was the first *"must"* set forth by the University of Wyoming for their new cafeteria and kitchen. This installation won a Grand Award in Institutions magazine's 1950 Food Service Contest. If you, too, want *"the finest and most modern"* for your food service requirements, buy "Blickman-Built" equipment. On every basis of comparison—durability, sanitation, appearance, low up-keep—it is your wisest investment.

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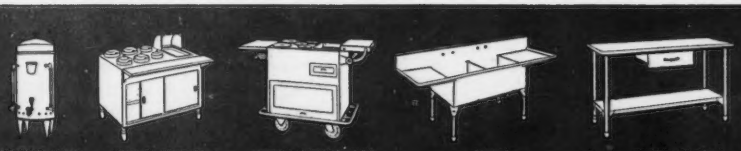

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GOLDEN YAMS

Dress up your plates — pamper your food budget with Louisiana Golden Yams, the juicy-textured kind of sweet potatoes everyone prefers.

Appetites spark to the glowing color and fine flavor of this nutritious, energy food. Serve them baked, mashed, candied or fried — as a *vegetable*, as *dessert*. They cost so little, taste just right — with anything.

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"Cancer and Nutrition" will be the topic of another meeting, and an all-day food institute on "Purchasing and Personnel" will be sponsored jointly with the Philadelphia Hospital Association, the Hospital Council of Philadelphia, and the Philadelphia Purchasing Service. This year's officers of the Philadelphia Dietetic Association are: President, Margaret A. Neubert, Friends' Hospital; Vice-President, Ardenia Chapman, Drexel Institute of Technology; Secretary, Eleanor Meagher, Jefferson Hospital; and Treasurer, Christine M. Austin, Institute of Mental and Nervous Diseases, Pennsylvania Hospital. The Section Chairman are: Community Nutrition, Anna P. K. Stapler, Pennsylvania Department of Health, Jenkintown; Diet Therapy, Natalina Scardamaglia, Woman's Hospital; Food Administration, Mildred Haas, Germantown Hospital, Philadelphia; and Professional Education, Corinne H. Robinson, Lansdowne.

The program for the year of the *Pittsburgh Dietetic Association* will include the subjects: "Nutrition and Dental Caries," "Nutrition for the Community's Children," and "Nutrition in the Nursing Curriculum." In addition, one meeting will be devoted to the joint UNESCO-FAO project for the year—"Food and People." A local person will talk on the "Food and People" campaign, and an effort will be made to align all local groups to follow the same pattern. The Pittsburgh Association has completed a new exhibit which was the official state exhibit at the A.D.A. Annual Meeting in Washington, after which it was shown in Philadelphia. It will be shown in other local areas later. New officers of the Pittsburgh group are: President, Mary Agnes Wesner; Vice-President, Ruth Reuning; Secretary, Lucille Horton; and Treasurer, Helen Kmetz.

Association Activities

Representatives at State Meetings. The following members of the Executive Board and the A.D.A. staff will represent the Association at state meetings:

November 3 and 4—Lillian Storms Coover, Illinois Dietetic Association, Springfield

November 3 and 4—Margaret L. Ross, Florida Dietetic Association, Tampa

November 3 and 4—Margaret A. Ohlson, South Carolina Dietetic Association, Columbia

November 9 and 10—Margaret A. Ohlson, North Carolina Dietetic Association, Fayetteville

November 16—Winifred H. Erickson, Nebraska Dietetic Association, Lincoln

A.D.A. Representatives at Meetings and Functions. The second meeting of the National Conference on Nongovernmental Organizations on FAO (Food and Agriculture Organization) was held in Washington, D. C., on September 29. Anne Stewart Miller attended for the Association.

Crystal Roney was invited to represent A.D.A. at the 32nd annual convention of the *American Gas Association* held in Atlantic City, October 2 to 6.

Jo Beth Johnson represented the Association at the *Diamond Jubilee in commemoration of the Founding of Brigham Young University*. The celebration was held October 16 in Provo, Utah.

Four of our members represented A.D.A. at the *New York* Herald Tribune *Forum* which was held at the Waldorf-Astoria Hotel, October 23 to 25. The four sessions were devoted to a critical, objective review of the economic state of the nation and the problems facing our American economy that are directly related to the deepening international political crisis. Our delegates were Helen Hamilton, Meredith Jones, Lucile Streator, and Alta B. Atkinson.

News of Advertisers

Pfaelzer Brothers recently have added a boneless roasted turkey to their MEL-BRO line. The new item is 100 per cent turkey with no gelatin added. Cylindrical in shape, each "turkey" weighs 4 to 6 lb. on the average, and is ready to heat and serve. Each "turkey" is packed in its own skin which is said to have two advantages over Cellophane or foil: it results in retention of full flavor, and the meat is held together after it is sliced. The new product is available in three types—all white meat, all dark meat, and a combination of 60 per cent white and 40 per cent dark meat. The three types are also available uncooked for those who prefer to roast the product themselves.

You and Meat in This Protein Era by J. D. Ratcliff has been published by the *American Meat Institute* as an interpretation of an article, "Protein Comes into Its Own" by Dr. James S. McLester which appeared in the *Journal of the American Medical Association*. The fourteen-page booklet explains the value of protein both in building up patients before and restoring their strength after surgery, keeping healthy people healthy, and insuring proper development and growth in children.

The *Amino Products Division* of *International Minerals & Chemical Corporation* has announced that ready-to-cook chicken, both fresh and frozen, is now being prepared with Ac'cent, pure monosodium glutamate. Ac'cent in solution is "stitched" into the dressed birds in six or seven places to permeate the meat, intensify and fix the flavor. The label identifies chickens so prepared.

Duke Manufacturing Company has announced that it is now possible to buy inexpensive cafeteria and kitchen service counters which combine the Thurmaduke waterless food warmer with various other standard units, including: urn stands, cold pans, solid top units. Bain Marie units, water station units, and cashier's units. All are standard units available in a variety of sizes to fit any particular requirement. They may be obtained in either stainless steel or with an oven baked gray enamel finish.